and Aviation

Volume 93

ntaine hour ad n

he u

h too unnin

ount

chara

as lim

of a

S, 28 agains sphat ig ap s thos

tment n thei nning y low hethe ts ha gean ve re arly a cations its di ail by

o, an-

ber of e beer and i

rge (Mead

Water

Cleve T. (

y the

Haven

ent.

10.

iits

łs

ED

TRIES

an sivel

St., 1 ner Published Semi-Monthly July 15, 1945

JULIAN CHASE, Directing Editor
JOS. GESCHELIN, Detroit Editor
JOS. GESCHELIN, Detroit Editor
JOS. GESCHELIN, Detroit Editor
JOS. GESCHELIN, Detroit Editor
MARCUS AINSWORTH, Statistician
L. W. MOFFETT, Washington Editor
DAVID J. ANSBORD, JR., Washington News Ed. R. RAYMOND KAY, West Coast
EUGENE J. HARDY, Washington Ass't Ed.

MARCUS W. BOURDON, British

CONTENTS

Black Is Black Regardless, by Julian Chase	15
OPA Pricing System Unsound Parts Makers Contend, by Leonard Westrate	17
Details of the Coronado PB2Y-3 Design, by Ernest G. Stout	18
Mercury and Lincoln 1946 Styling	23
Centrifugal or Axial Superchargers	24
More British Postwar Aircraft, by M. W. Bourdon	26
Model 37 Airliner Design, by R. R. Hoover	30
Four Types of German Aircraft Engine Radiators, by M. W. Bourdon	32
Recent Developments in Brake Mechanisms Part Two, by P. M. Heldt	36
Airbriefs, by Henry Lowe Brownback	42
News of the Industry	44
New Production Equipment	50
New Products	60
	228

Copyright 1945 by Chilton Company (Inc.)

Automotive Division Jos. S. HILDRETH, President and Manager G. C. Buzby, Vice Pres.

JOS. S. HILDRETH, President and Manager

Julian Chase, Vice Pres.

OFFICES

Philadelphia 39, Pa., Chestrut & 56th Sts., Phone Sherwood 1424

New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600;
Chicago I, Ill., Room 916, London Guarantee & Accident Building, Phone
Frankiln 4243; Detroit 2, Mich., 1015 Stephenson Bidg., Phone Madison
2000; Cleveland 14, Ohlo, 1036 Guardian Bidg., Phone Cherry 4188; Washington 4, D. C., 1061 National Press Bidg., Phone District \$109 and \$110;
San Francisco 5, Calif., 605 Market St., Room 708, Phone Douglas 981;
Los Angeles 1, Calif., 6000 Miramonte Bivd., Phone Lafayette 5525. Cable AddressAutoland, Philadelphia

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

AUTOMOTIVE and AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by CHILTON COMPANY (INC.)

Executive Offices Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A.

Officers and Directors C. A. Musselman, Chairman of the Board Jos. S. HILDRETH, President

Vice-Presidents GEORGE H. GRIFFITHS
J. H. VAN DEVENTER
C. S. BAUR
WILLIAM A. BARBER, Treasurer
JULIAN CHASE
HARRY V. DUFFY

Vice-Presidents
EVERIT B. TERHUNE
P. M. FAHRENDORF
JOHN BLAIR MOFFFITT, Secretary
G. C. BUZBY
CHARLES J. HEALE

WILLIAM H. VALLAR, Asst. Treas.

KEEPING THE TOKYO EXPRESS"

ROLLING



SERVICE

This familiar scene is being repeated daily in the South Pacific, where American invasion forces are using FOOD MACHINERY CORPORATION'S LVT's by the thousands to sever the tentacles of the Jap octopus.

From Guadalcanal to Okinawa, Young equipped "Water Buffaloes" have had an important part in clearing the road to Tokyo. The engines of these rugged amphibians that carry American landing forces and equipment through treacherous seas onto stubbornly defended beaches are maintained at proper operating temperatures by Young Lube Oil Coolers. Here, as with many other engines of war and industry, Young Heat Transfer Units are proving equal to the most severe tests. This ability to absorb punishment is born of nearly a quarter century of heat transfer engineering experience. Let Young engineers assist you in finding the solution to your cooling problem. There's no obligation.

HEAT TRANSFER PRODUCTS

Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiaters • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Heating Coils • Convectors • Candensers • Evaporators • Air Conditioning Units • Cooling Coils • and a Complete Line of Aircraft Heat Transfer Equipment.

YOUNG RADIATOR CO., Dept. 215-G-2, Racine, Wis., U. S. A.

July 15, 1945

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

AUTOMOTIVE and AVIATION INDUSTRIES. Vol. 93, No. 2. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign \$2.00 per year; single copies, 25 cents, except Statistical Issue (Mat. 15th). 56 cents.



When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

Black Is Black Regardless

by Julian Chase

A NUMBER of citizens get together and deliberately plan, or whether planning or not, do take joint action which inevitably results in financially ruining an employer of labor and putting him out of business. That's perfectly all right and according to Hoyle as presently interpreted. Our courts have said so. We can call this highly favored aggregation of conspirators Group A.

Some other citizens get together and, even without intent, take joint action which has the same result or may tend to have the same result. That's all wrong and by no means according to Hoyle. Our courts have said so. We can call this band of errant collaborators Group B.

It sometimes happens that Group A and Group B get together and jointly do what is right for one and wrong for the other. It may be restricting trade, destroying commerce or leading a businessman to economic slaughter. Both groups are wrong in such a case. Our courts have said so.

Now what is the explanation of this obvious and tragic inconsistency? The effects on our economy are exactly the same in all three instances. The public welfare is affected in the same manner and to the same degree. Combinations in restraint of trade and conspiracies to restrict commerce have repeatedly been declared to be bad by both our Congress and our courts and yet Group A, acting alone, has, with the connivance of our legislators and our judiciary, and with the tacit approval and indirect encouragement of the administrative branch of our Government, restrained trade, interfered with commerce, hijacked food for our people on its way to market, committing, thereby, what some justices have called highway robbery. It has blackjacked wage earners who want to work. It has destroyed production property. It can do many other vicious things, the doing of which by Group B, would quickly land it in jail either individually or collectively, and nothing will happen. The action might even get legal endorsement. Why?

The answer is, of course, that Group A represents organized labor; not all organized labor, but its unenlightened portion. Group B represents the rest of us. That distinction, when we get down to the bottom of things, is definitely wrong and not according to the original American edition of Hoyle. It is the kind of evil that can easily destroy democracy. It is the result of what Pope Pius XII has called "the overwhelming strength of organized masses, ready to use their power to the detriment of justice and the rights of others." It is the result of the combination of this strength with the woeful weakness of our politicians.

The Federal Labor Relations Bill, drawn largely by a high-ranking labor attorney, is designed to correct some of these abuses under our present laws which seriously and violently threaten the very system under which labor unions thrive most lustily. And what attitude do our labor leaders, generally, take toward this badly needed reform? They oppose it. They are long overdue in arriving at the age of maturity.

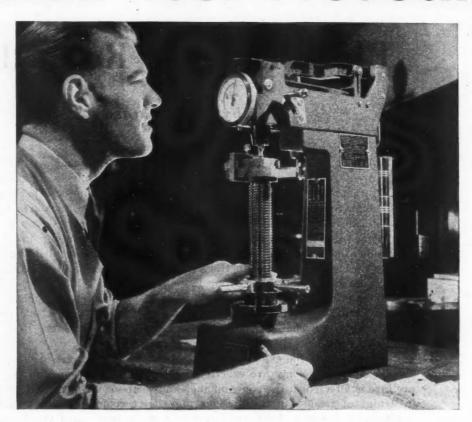
TOTAL A SESTRIATE ANDHOSTIT

Automotive Industries

Reg. U. S. Pat. Off.

RIES

How Ryerson Alloys Protect Your Production



Every Department is Served

When your shipment of Ryerson alloy steels arrives, complete test data comes with them—data that enables engineers and designers to call for the physical properties listed, with confidence that they can be secured—that furnishes heat treaters with a guide to sure, accurate results and provides a detailed record for your purchasing executive.

As a part of the Ryerson Certified Steel Plan, this data is developed from actual laboratory tests. In addition to mill tests for chemical analysis and physical characteristics, Ryerson subjects samples from each alloy heat to four end-quench hardenability tests. From hardness readings of the

test samples we interpret obtainable physical properties for various size rounds in the as-quenched condition and when quenched and drawn at 1000°, 1100° and 1200° F.

This test data comes with alloys which

are identified by heat symbol as well as by color marking. And to make doubly certain that you get the right steel Ryerson checks against mixed shipments by spark testing all alloys in stock. AU

tio

he

Ryerson alloy service costs you nothing extra. It protects your products and production. It saves time and money. It is furnished by 11 Ryerson Steel-Service Plants, each located in a major industrial area. The Ryerson alloy plan is explained in detail in our booklet "Interpreting Hardenability". If you did not receive a copy write today. And get in touch with your nearest Ryerson plant when you need alloy steel from stock.



JOSEPH T. RYERSON & SON, INC. Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL

ALLOY STEELS . ALLEGHENY STAINLESS . TOOL STEEL . SCREW STOCK . BAR PLATES . SHEETS . STRIP STEEL . STRUCTURALS . TUBING . PIPE . MACHINER

OPA Pricing System Unsound Parts Makers Contend

Details of the (

The automotive parts industry, like many others, is the victim of the widespread and popular delusion that the miracle of American war production is largely the result of increased labor productivity. That misconception is the marrow in the bone which the industry now is picking with the Office of Price Administration over the extent of price increases which must be allowed if the parts makers are to operate on a sound economic basis in the transition period to peacetime automotive production.

Although OPA shares in the general delusion that labor productivity has increased throughout the war, and that for this reason any price increases should be held to the extent of direct and traceable rises in labor and material costs, parts makers contend that individual efficiency actually has decreased and that the principal reason for the high wartime output is ex-

panded and expensive tooling which would not be practical under peacetime economy. They point out that whereas in 1939 there were up to ten million persons unemployed representing the least effi-

cient workers, these have since been absorbed into industry with a very evident lowering in average efficiency. On the other hand, 11 million men, representing the cream of the crop, have been taken into the Armed Forces. Both of these factors have diluted the labor effectiveness of the overall labor forces, and with the general loss of discipline through union activities, individual effort has declined greatly from prewar levels. If full employment is to be attained in the postwar period, the inevitable result will be lower average efficiency than in prewar years because the least efficient still will be working. As a result, the industry holds as untenable OPA's premise that improved labor effectiveness will offset the increased costs of administration, taxes, payroll deductions, bonuses, retraining, transfers, and other wartime innovations, many of which will remain permanently.

A typical case history of one parts maker's experience with wartime tooling and production costs serves to point up the industry's contention that production methods used under the pressing and peculiar conditions of war cannot be used as a yardstick of peacetime production costs. This company early in the war received an order for 30 million units of a small intricate fuse part. Initial tooling cost was three million times the original unit selling price, which was reduced

several times during the life of the contract. Later, as the contract was increased in volume to more than 100 million units, tooling was elaborated, so that at the end of operations it exceeded 10 million times the final price of the part, which had been lowered approximately one-third from the original.

There are several significant factors here. One is the size of the contract. At peak production, the company turned out four million units in one month—enough to supply an equivalent automobile part for every passenger car built during a normal prewar year. If one parts maker were to supply all of one particular part for all the cars made in a six-million car year, his contract would be only one-fifth the volume of the original fuse order and about one-sixteenth that of the total contract. Obviously, he could not afford to tool so elaborately for a much smaller order.

Another very important factor is the ratio of the cost of tooling to the selling price of the finished item. Whereas in the war job it amounted to 10 million, under normal peacetime production it would

total on the average only 10,000 to 15,000 times the selling price, depending on the nature of the part. Also, the economies inherent in having one customer of unimpeachable credit rating and a secondary consideration for cost, coupled with a demand for volume which has no peacetime precedent, are not possible under the conditions of much smaller volume and fierce competition that exist under normal times in the parts industry.

This particular case also serves to contradict the impression that high levels of war output have been due mainly to increased effort by labor. At the outset of production, the part was made by several operations. Later, however, a machine was developed which performed the whole operation automatically, enabling one girl to do the work formerly required by 35. The volume required justified the heavy investment, whereas in normal parts production it would not have been economically sound.

OPA contends that during the war many new materials and techniques and greatly improved equipment have been developed that will lower production costs in the postwar period. In answer to this, spokesmen for the parts makers say that it is true that some new processes have been developed, but that

(Turn to page 104, please)

By Leonard Westrate

R S ERY

RIES

July 15, 1945

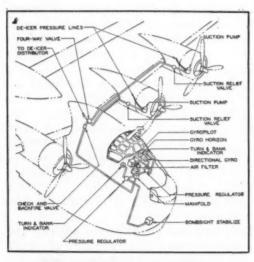
Details of the Coronado F

Interior heating system.

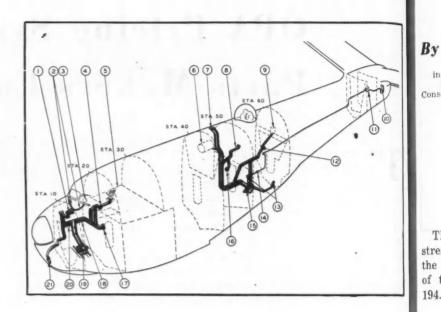
1. Booster fan
2. Windshield defroster ducts
3. Defiection control
4. Anemostat for flight deck
Heat outlet at step
5. Radio operator's heat outlets
6. Water tank (het air heated)
7. Engine preheat duct outlet
9. Upper turret heat outlet
9. Apu oil tank heater
10. Tail turret heat outlet
11. Tail turret heater
(fuel air mixture)

12. Apu preheater
13. Waist gunner's heaters
14. Manual shut-off valve for tail
heater fuel line
15. Aft heater (separate unit)
16. Crew's quarters anemostat
17. Officers' quarters anemostat
18. Forward heater damper
19. Forward heater
20. Manual shut-off valve for pilot's
and bombardier's line
21. Bombardier's heat and defroster
duct

THE Coronado PB2Y-3 is one of the world's largest flying boats and has the added distinction of being suitable for missions as a patrol plane, bomber, torpedo bomber, cargo carrier, and transport. As its designation implies, it is the third of a series of long range patrol bombers constructed for the U.S. Navy by Consolidated Vultee Aircraft Corp. It has a wing span of 115 ft, a length of approximately 80 ft, a height of over 27 ft, a maximum speed of approximately 220 mph, and a range of more than 2900 miles. Flight crewmen call it a "flying hotel" because it is probably the most comfortable of all modern warplanes.



Engine-driven vacuum pumps and oil separators are installed in two of the PB2Y-3 engine nacelles for the operation of air-driven instru-ments and anti-icing equipment, as indicated above.



General Data on the

T

Co

Stab Dista

Dian

Ту

Sp

Flap

At

Gr

Le

He No GI Dra Gi Dist Ster

Fi Se Ang Ang A

Ang M C

Ang

Sta Coe R Aux

Dis Bea Lei

An

Ju

MAXIMUM C. G. TRAVEL LIMITS OF MEAN AERODYNAMIC	CHOR	D
Aerodynamic		
Forward limit for adequate control, landing, power off	23.0%	MAC
Aft limit for adequate stability cruising power	34.0%	MAC
Hydrodynamic		
Gross Weight 66,000 lb, take-off power		
Forward Limit	*24.0%	MAC
Aft Limit	34.0%	MAC
*Flaps zero over the hump must be maintained for all C. G. position forward of 28% MAC.		
Flaps 20° throughout take-off must be used aft of 28% MAC.		

PRINCIPAL DIMENSIONS

PRINCIPAL DIMENSIONS		
Span: Wings	115.00	ft
Height, Over Tail Thrust Line Level (Approximate)	27.50	ft
Height, Over Engine Nacelles (Deck Level)	17.25	ft
Height, Over Propellers on Beaching Gear		ft
Height, Over Keel to Top of Hoisting Sling (Approximate)	17.25	ft
Angle of Deck Line to Reference Line	0 °	
Length (Maximum)	79.25	ft
Length from Hoisting Sling to Farthest Aft Part of Tail, Thrust		
Line Level, Rudder Neutral, Elevator Down	51.67	ft
C. G. (Empty) Percent MAC (Combat)	24.9%	
**L.E.W. to C. G. (Patrol-Normal) (Cruising Combat)	8.45	ft
**L.E.W. to C. G. (Bomber 4-1000 lb Bombs) (Cruising Combat)	8.49	ft
**Center of Gravity, Normal Loading Condition (Patrol Cruising		
Combat)		
Horizontal Location, Percent MAC	27.4%	,
Vertical Location, Below Hull Deck	3.09	ft
Horizontal Distance to Top of Rudder Hinge Line	43.88	ft
Horizontal Distance from Elevator Hinge Line	46.74	ft
Dihedral (Due to Taper Only) (On Lower Surface)	2°25'	
Dihedral Wings (Outer Panels) (On Lower Surface)		
Dihedral (Chord Plane)	1°18'	-52 in
Sweepback		
Chord at Root Section (Maximum)		-0 in.
Chord at Construction Tip Section	137.16	in.
Mean Aerodynamic Chord, Inches		
Wing Section and Thickness; at Root Section (% Chord) (NACA		
23017)	17%	,
At Construction Tip Section (1% Chord) (NACA 23009.6)	9.6%	
Average-Frontal Area Divided by Wing Area		
Effective Aspect Ratio of the following:		
Wing Cellulue	7.43	to 1
Horizontal Tail Surfaces	4.47	to 1
Vertical Tail Surfaces	1.49	to 1
Aileron Span (Approx.)	21.35	ft
Aileron Chord, Mean (Aft of Hinge)	3.39	ft
Wing Incidence, at Root Section	+30	
Clearance of Wing at Root above Normal Load Waterline, Base		1
Line Level (Approx.)	8.83	ft
Clearance of Wing at Root Above Keel at Step		ft
Tail Spin	38.10	ft

By Ernest G. Stout
Staff Engineer
in Charge of Hydrodynamics,
Development Design Staff,
Consolidated Vultee Alreraft Corp.

Phantom view of the Coronado PB2Y-3 hull.

The PB2Y-3 wing is a full-cantilever structure with stressed skin construction. It comprises three panels, the center of which passes through the upper portion of the hull. It has a mean aerodynamic chord of 194.3 in. and a weight empty of 10,243 lbs.

The center wing panel has nacelles which house four 1200 hp engines, four built-in fuel compartments, eight internal bomb bays, and two trailing edge wing flaps. Positive controls make it possible for the flaps to be held in any given position within their design

limits.

The outer wing panels are removably attached to the center wing panel and each has an aileron slot, a leading edge landing light, and a retractable wing tip float. A screwtype mechanism inside each outer panel makes it possible to extend and retract the floats.

Except for the ailerons, all wing surfaces are metal covered. The ailerons are of metal torque box and rib construction with fabric covering.

Exposed rivets on the leading edge of the wing are countersunk. Virtually all of the other rivets on the

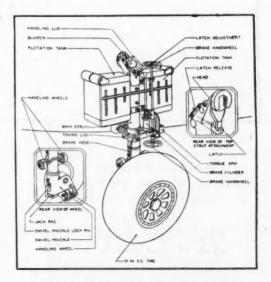
Coronado PB2Y-3 Flying Boat

the

MAC

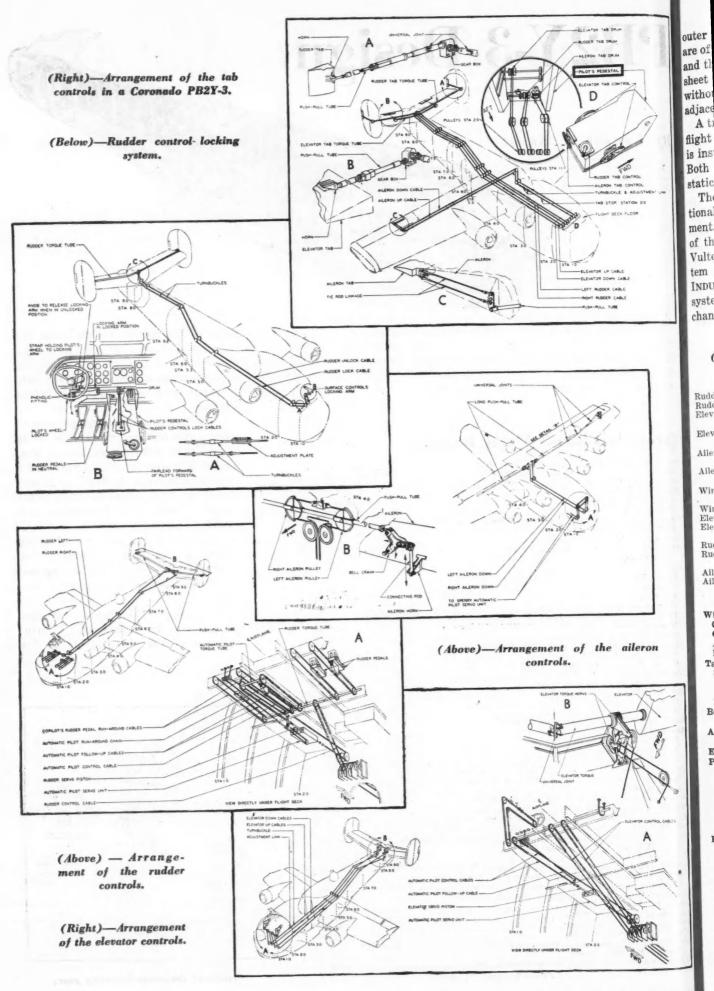
Stabilizer, Incidence	+20		
Distance from Bow to Hull to Leading Edge Wing Center Section	19.29	ft	
Diameter of Propeller (Three Blades)			
High Lift Device:			
Type of Wing Flap	Plain		
Type of Wing Slot	None		
Span of Wing Flaps (% of Wing Span) (Ailerons to Hull)	37.97	ft	
Flap of Chord Aft of Hinge, Average (% Wing Chord)		,	
Flap Angle, Maximum (Degrees)	40°		
**Propeller Clearance, Normal Patrol Condition:			
At Rest on Water	4.46	ft	
Hull:			
Gross Displacement, Lbs at 64 lbs per Cu Ft	455,000) lb	
Length	79.25	ft	
Beam	10.50	ft	
Height, to Deck Line	16.33	ft	
Draft, Perpendicular to Load Waterline from Lowest Part of Hull:			
Normal Load Condition			
Gross Weight, Maximum	4.29	ft	
Draft to Bottom of Beaching Gear Wheels:			
Normal Load Condition			
Gross Weight, Maximum			
Distance: Bow to First Step			
Bow to Second Step	54.38	ft	
Step Depth:			
First			(Avg.
Second		ın.	
Angle of Deck to Thrust Line, Degrees	0.		
Angle of Keel to Thrust Line: Forward of Step.	140		
Aft of First Step.		,	
Aft of Second Step.			
Angle of Line Joining Normal C. G. and a Point on the First Step			
Midway Between Keel and Chine, with Transverse Plane through			
C. G. and C. B.			
Angle of Heel at which Wing Touches Water			
Height of C. G. above C. G., Normal Loading Condition	9.80		
Static Load Coefficient = Normal Gross Weight Divided by the		10	
Cube of the Beam in Ft and Density of Sea Water		2	
Coefficient CVG = getaway speed in Ft per Sec Divided by the So		-	
Root of 32.2 times the Beam in Feet			
Auxiliary Floats:	1.20		
Submerged Displacement of each, Lbs at 64 Lbs per Cu Ft	3.260	lb	
Angle of Heel to Submerge, Normal Loading Condition	5°		
Distance, Normal Load Waterline to Lowest Point on Float	2216	in.	
Distance, Centerline of Airplane to C. B. of Float	49.96	ft	
Beam of Auxiliary Float	2.67	ft	
Length of Auxiliary Float.	11.42	ft	
Height of Auxiliary Float	2.75		
Tread of Auxiliary Floats	99.92	-	
Horizontal Reference Line is Assumed to be the Line of the After	•		
Part of the Hull Deck			
Angle of Full Load Waterline to Thrust Line	+1.6	60	
	,		

(Turn to page 21, please)



Details of the main beaching gear.

RIES



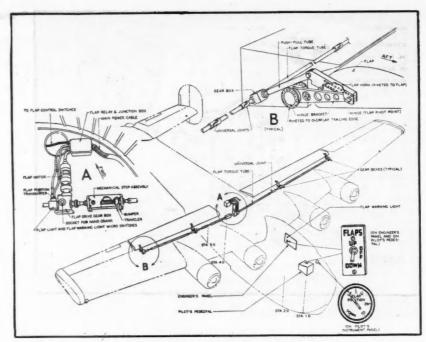
Aile

Wit

outer portion of the wing structure are of the modified brazier-head type, and they are applied so that any one sheet of wing skin can be replaced without extensively disassembling adjacent parts.

A trailing edge tab, controllable in flight from the pilots' compartment, is installed in the right aileron only. Both ailerons are dynamically and statically balanced.

The first Coronados had conventional deicing and anti-icing equipment. However, all recent versions of the PB2Y-3 feature Consolidated Vultee's new thermal anti-icing system (see AUTOMOTIVE and AVIATION INDUSTRIES, Sept. 15, 1943). This system employs exhaust-heat exchangers to warm fresh air; then,



Arrangement of the flap controls.

(Data continued from page 19)

FULL ANGULAR CONTROL MOVEMENTS (As Limited by Stops in Pilots' Cockpit)

(MS Ellinted by Grobe in I mere compre)
Rudder
Rudder Pedal —6 in.
Elevator 25° above
15° below
Elevator Control
11 in. aft
Aileron 16° above
16° below (2°
Aileron Control (Wheel) 13 15/16" Diameter 245° right
245° left (-5°)
Wing Flap 0° above
Wing Flap
40° below
Wing Flap Control—Motor Drive
Elevator Tab Movement+4½° or -6½°
Elevator Tab Control
of movement
Rudder Balance Tab+10°
Rudder Tab Control
for movement
Aileron Tab Movement+15°
Aileron Tab Control 5 turns for 30°
of movement
WEIGHT THE CONTRACTOR
WEIGHT EMPTY (COMBAT CONDITION)

Wine Comment of the C	0.0
Wing Group	
Center Section (or Upper Center)	
Outer Panel (or Lower Center)	
	4.0
	5.0
Tail Groups 1,02	9.0
	0.88
	3.0
	1.0
	37.0
Body Group 7.19	14.0
Hull 7.19	4.0
Alighting Gear—Water Type	20.0
Auxiliary Floats 62	20.0
Engine Section or Nacelle Group	18.0
Power Plant Group	
Engine (As Installed)	
	25.0
	61.0
Propellers 1.78	
	19.0
	22.0
Fuel System 1.14	
	727.0
The second secon	31.0
	85.0
Electrical	
Armament Provisions (Including Gunfire Protection) 2,93	0.00
Furnishing 2,50	
Personnel Accommodations	
	11.0
The state of many as	
A f - 100 - 1111 - 1 - 1 - 1	94.0
A	24.0
A	76.0
Auxiliary Gear	43.0
Service Pickup Totals	
	05.0
Weights Empty	32.0
(Turn to next page, please)	

through a suitable system of ducts, it distributes the air so as to heat hull compartments and prevent ice formations on windshields and vital airfoil surfaces.

Power Plant Group

The four PB2Y-3 engines are Pratt & Whitney R-1830-88's with two-stage blowers. They are geared 16:9 and rated as follows:

1100 bhp @ 2550 rpm from SL to 2500 ft. 1050 bhp @ 2550 rpm @ 12,000 ft. 1000 bhp @ 2550 rpm @ 19,000 ft. 1200 bhp @ 2700 rpm for take-off 3050 rpm maximum allowable dive speed for

Curtiss electric constant - speed propellers provide thrust and can be synchronized by means of a control on the pilots' pedestal. Each has three aluminum-alloy blades and a diameter of 121/2 ft.

A noncongealing-type oil cooler with a double outlet rotary control valve and check is installed so as to maintain an inlet oil temperature of not more than 80 C for each engine. Breather pipes conduct oil vapors from the engine crankcase to the open air, clear of exhaust outlets.

All parts of the exhaust disposal systems are located and ventilated so as to prevent any adjacent structure from reaching a temperature which might in any way impair its strength or constitute a fire hazard.

No provisions have been made for preheating intake air, but there is an

RIES

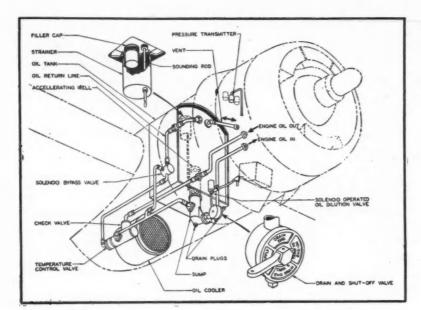


Diagram of the oil system.

side waist machine guns which can be aimed manually. One is situated on each side of the airplane in the aft portion of the hull. A complete system of armor plating protects crewmen and vital airplane parts.

Hull Arrangement

The area immediately below and aft of the nose gun turret is known as the "bow compartment." It contains complete facilities for bombing operations and all the equipment necessary for anchoring or mooring the airplane. Above and aft of the bow compartment between bulkheads two and three is the flight deck, which has seating arrange-

alternate nonramming intake air supply from behind the engine cylinders within the cowling for each engine. It includes a valve and a control which can be operated by the flight engineer.

Engine-driven vacuum pumps and oil separators are installed in two of the engine nacelles for the operation of air-driven instruments and anti-icing equipment.

Armament

The Coronado armament includes three power-operated machine gun turrets, each of which houses two .50-caliber machine guns. One is in the bow; another is in the top hull waist, and a third is in the tail. Also, there are two flexible

Data continued from preceding page

UNIT WEIGHTS

Wing Group (Gross Area 1,780 Sq Ft)	5.7 psf
Tail Group (Gross Area 539 Sq Ft)	1.9 psf
Submerged disp. Main Floats or Hull	3,260 each
Weight of Main Floats and Bracing	55,000 lb (Hull)

DESIGN INFORMATION

Length-Max	79.25	ft	Thickness Root Chord.	17%
Height-Max	27.50	ft	Thickness Tip Chord	96%
Span	115.00	ft	Wing Area-Net	1,780 sq ft

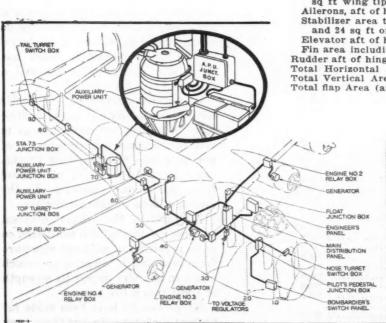
Maximum Fuselage	Width	10.50 ft
Length Root Chord		20.00 ft
Length Tip Chord.		11.33 ft
Maximum Fuselage	Depth	16.33 ft
Design Gross Weigh	ht	66,000 lt

UNIT WEIGHTS OF WEIGHT EMPTY ITEMS

			** = 1 - 1 - 1		
Weight of v	wing group	per sq ft r	et wing area		sq ft) 5.7
Weight of t	ail group 1	ner so ft ta	il surface net	(539	sa ft) 19

AREAS (SQ FT)

Total wing area including ailerons, 180 sq ft hull area and 61 sq ft wing tip float area
Ailerons, aft of hinge, 2 at 74.5 sq ft including 3 sq ft tab area 149 Stabilizer area to elevator hinge including 45 sq ft hull area
and 24 sq ft of contained elevator balance
Elevator aft of hinge including 3 sq ft of tabs 90
Fin area including 23 sq ft contained rudder balance 147
Rudder aft of hinge including 2.7 sq ft of tabs
Total Horizontal Area
Total Vertical Area
Total flap Area (aft of hinge)



ments for a pilot, a copilot, a commanding officer, a radio operator, a navigator, and a flight engineer. Below the flight deck are heated and ventilated officers' quarters with four bunks, two lockers, and one folding table.

Adjoining the officers' quarters, between bulkheads three and four, is the main entrance compartment, whose after end is the galley. The main entrance (Turn to page 116, please)

AUTOMOTIVE and AVIATION INDUSTRIES

20 - 10 - 1

Mercury and Lincoln 1946 Styling

an be

each on of rmor air-

d aft s the comtions r anbove bethe ange-

Hull)

sq ft

5.7

ndtor, ght

ers'

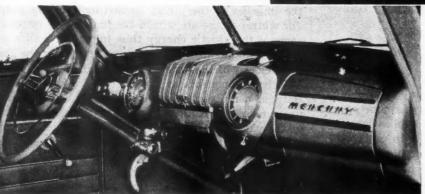
be-

the

ter nce

ES





Outstanding exterior styling changes on the 1946 Mercury car are the front grille and wide hood ornament, the former featuring die cast vertical louvres across the front. Production is expected to start in August or September and the first cars off the line will be in one or two body styles. Later five Super Deluxe body styles will be built, comprising two and four-door sedans, sedan coupe, convertible coupe and station wagon. This photo shows the first handmade car built at the Ford Rouge plant.

Easier - to - read speedometer and clock dials and glove compartment nameplate are new on the Mercury panel, which with molding will be available in a selection of color schemes to harmonize with upholstery, including brown metallic, gray plastic, brown trim, gray green metallic, gray plastic or red orange trim;

ORD MOTOR CO. plans to build Ford 1946 cars in six Super DeLuxe body styles and three DeLuxe styles, but the number at present is being limited. Production started at the Rouge plant July 3. The Super DeLuxe model will comprise two and four-door sedans, a five-window coupe, sedan coupe, convertible coupe and station wagon. The DeLuxe styles include two and four-door sedans and a five-window coupe. New features of the Super DeLuxe model were given in the June 15 issue of Automotive and Aviation Industries. In addition to the 100-hp V-8 engine, the six-cylinder 90-hp engine will be available.



The quadrated pattern of the die-cast grille, built-in fog lights hood side and top ornaments are among the new exterior features on the '46 Lincoln. Limited production is expected to start in several months with two body types —four-door sedan and club coupe

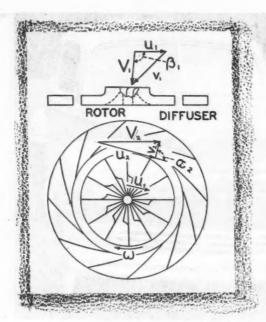


Fig. 1—Diagram of centrifugal compressor rotor and diffuser.

VER since supercharging of aircraft engines was first attempted, during the closing stages of World War I, the centrifugal type of compressor has been used for the purpose. In some applications it is driven directly from the engine, while in others it is coupled to a turbine operated by the engine exhaust. In recent years considerable work has been done on gas turbines and jet-propulsion power units, in both of which the combustion air is compressed by means of centrifugal or axial compressors. The demands made on superchargers with respect to specific output and efficiency have increased greatly as a result of the hothouse development of aircraft engines previous to and during the current war,* and the thought naturally occurred to designers that a switch from the centrifugal to the axial type of compressor might be of help in solving the problems with which they are confronted.

Properties of the two types and their relative merits from the standpoint of their use as aircraft-engine superchargers were discussed in two recent S.A.E. papers, one entitled "Axial vs. Centrifugal Superchargers for Aircraft Engines," by W. J. King of General Electric Co., the other, "Some Advantages and Limitations of Centrifugal and Axial Aircraft Compressors," by Kenneth Campbell and John E. Talbert, of Wright Aeronautical Corp. The following discussion is based chiefly on these papers.

Centrifugal superchargers as now used show maximum efficiencies of 70-75 per cent. An increase in the efficiency is desirable for several reasons. Losses within the supercharger are converted into heat, most of which is absorbed by the air being compressed, the temperature of which is thus raised. An increase in the temperature of the air that is being delivered to the inlet manifold of the engine is objectionable, be-

Centrifugal

cause it reduces the mass of air admitted to each cylinder per cycle, thus reducing the power output, and it also promotes detonation. A third objection to low supercharger efficiency is that for a given air delivery and pressure ratio, the power absorbed by the supercharger is increased, and the net power of the engine correspondingly decreased.

こうちゃくかんなからないのははないなるとははないないと

sulf

ity

vel

res

ac

and

an

of

Th

los

ity

sin

ve

wi

ta

pr

bi

I

The operating principles of both types of compressor are quite similar. In both, energy is transferred from the impeller to the air by imparting a rotary motion (or whirl) to the air within the impeller or rotor, and some of the kinetic energy thus imparted is then converted into gas-pressure energy by reducing the absolute velocity of the air current in a diffuser or a stator. Velocity components at the inlet and outlet of a centrifugal compressor are shown in Fig. 1. The compressor has an axial inlet, and the tangential velocity of the vanes where the air first comes under their influence is relatively low. In the diagram, u_i represents the mean tangential velocity of the impeller vanes at the inlet, and v_i , the axial velocity of the air. The absolute velocity of the air immediately after entering

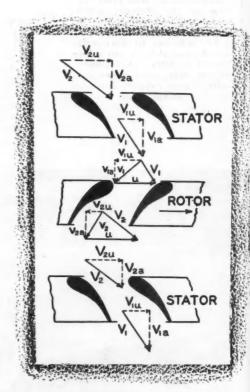


Fig. 2—Diagram of flow path through axial compressor.

During a period of 12 years the flow capacity of superchargers on radial aircraft engines had to be increased six-fold, and this was accomplished with comparatively little increase in the overall diameter and the length of the compressor.

or Axial Superchargers

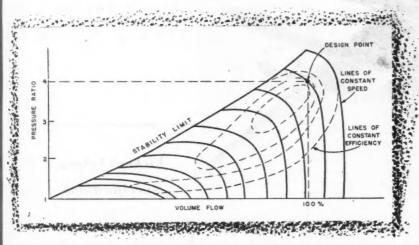


Fig. 3—Performance diagram for typical centrifugal compressor.

the compressor is represented by v_1 which is the resultant of u_1 and v_2 .

At the outlet from the impeller the tangential velocity of the vanes is u_2 ; the radial component of the air velocity is v_2 , and the absolute velocity of the air is the resultant of these two, v_2 . One of the causes of loss in

a centrifugal compressor is that the direction of air flow is changed more or less abruptly at both the inlet to, and the outlet from the impeller, and any sudden change in the direction of flow naturally results in losses. The relative magnitude of these losses depends on the absolute velocity of flow, and a factor in favor of the centrifugal compressor is that, since it has an axial inlet, the mean velocity of that portion of the vanes with which the air first comes in contact is relatively low.

Conditions of flow in an axial compressor are represented diagrammatically in Fig. 2. An axial compressor is quite similar to a steam turbine in design, comprising alternate sets of rotor and stator blades. The mean diameter of the blade rows increases from one end to the other. In a steam turbine the steam is admitted at the small, and exhausted at the large end, while in a compressor the air passes through in the opposite direction, entering at the

large, and leaving at the small end. In order to reduce internal losses in the axial compressor to a minimum, the blades are given airfoil forms, as shown in Fig. 2.

In the drawing are shown two sets of stator and one set of rotor vanes. Air entering the upper stator has an absolute velocity v_2 , which can be resolved into an axial component v_{2a} and a tangential companent v_{2n} . The axial component remains substantially constant from stage to stage, but the tangential component changes in each rotor and each stator. In the stator the tangential velocity of the air is reduced because the air current is deflected by the tail of the airfoil blade. The air leaves the upper stator and enters

the rotor with an absolute velocity v, of the magnitude and direction indicated by the arrow in the drawing. Now, the rotor has a (mean) tangential velocity u, which is greater than the tangential component of the air velocity, v_{iu} , and the air at the entrance to the rotor

(Turn to page 80, please)

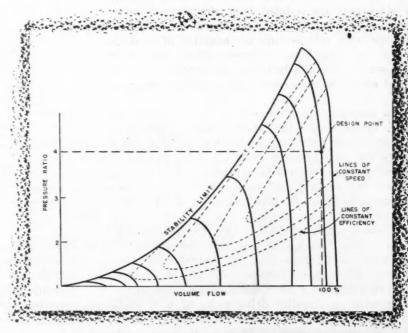


Fig. 4-Typical axial flow compressor performance.

RIES

cylin.

nd it

o low

ivery

uper-

ngine

essor from

otion

, and con-

abso-

ator.

cen-

ocity

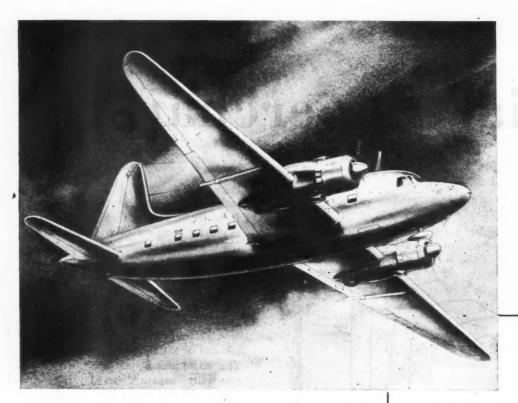
r in-

sents

es at

The

ering



More

nacel
impli
rang
i. e.,
off v
load
gross
(10,4
Re
lage
gain

pass

"floa resp

tach

runn

spar

flexi

secu

links

thes

ing |

men

limit

side

tran

fuse

ence

Vick

to ri

mou wing

rib .

July

Vi

Vickers Viking Specifications

S stated in AUTOMOTIVE AND AVIATION INDUS-TRIES of April 1, in which a number of British postwar aircraft were described, the aircraft section of Vickers-Armstrongs, designers and manufacturers of the famous Spitfire fighter and the Wellington medium bomber, have announced their intention of producing a medium-size air liner. Details of the design and construction have been released in England recently, and from these it is evident that, although the machine, for the most part, is conventional in design, it has quite a number of unorthodox features, notably a revolutionary wing-to-fuselage attachment which provides a flexible mounting for the wing. By this means, it is claimed, engine and air flow vibrations are isolated from the fuselage, with consequential benefit to the passengers.

Among other features are the adoption of geodetic construction of the wing, tailplane and fin and, under the passenger space, a baggage and freight compartment of which the floor constitutes a massive longeron keel.

To be known as the Viking V.C. 1 (V.C. signifying Vickers Commercial), the machine has a fuselage of elliptical section with approximately parallel sides over its full length, apart from the sharply tapered nose and tail end. It will be available in two models, standard and de luxe, differing only in seating accommodations. The de luxe model is a 21-seater, while the standard has 27 seats.

The power plant consists of two Bristol HE-10M engines, a new version of the Hercules air-cooled, sleeve valve radial type specially designed for civil operation. Each engine develops 1675 bhp at sea level at 2800 rpm and has a new type of single-speed supercharger with an impeller drive radio of 6.38 to 1. With a 0.44 to 1 gear ratio, the propellers are Rotol four-blade constant-speed, 13.25 ft in diameter, with

89 ft. 3 in. Wing span Overall length 63 ft. Height (cabin floor horizontal) 24 ft. Wing area . 882 sq. ft. Tailplane span Fin height above fuselage... 33 ft. Tailplane and elevator gross 176 sq. ft. area Fin and rudder gross area. 70 sq. ft. Max. external section of fuse-10 ft. 4 in. by 8 ft. 8 in. lage 9 to 1 Aspect ratio ... 9.88 ft. Standard mean chord..... Track 23 ft 33 ft. 8 in. Power and wing loadings at gross weight of 33,000 lb: 37.4 lb/sq. ft. Wing loading Power loading (3350 hp).....

Performance Data

Max. cruising speed at 10,000 ft	210 mph
Cruising power per engine	900 bhp
Cruising power as percentage of	
METO power	58
Cruising consumption	106 gal/hr
Still air range 500 gal. fuel, 210	
mph	1000 miles
Still air range 750 gal. fuel, 210	
mph	1500 miles
Minimum cruising speed at 10,-	
000 ft	160 mph
Take-off distance to clear 50 ft	850 yards
Time to climb to 10,000 ft	8 min
Service ceiling	22,500 ft
Total distance, start to stop, with	
engine failure at take-off	1,700 yds
Landing distance from 50 ft	850 yds

Rotol liquid de-icing. The wing de-icing equipment, it may be noted, is the TKS system described in Automotive and Aviation Industries of January 15. This system, it may be recalled, comprises porous metal spreaders for the de-icing fluid, built into the leading edge of the wing sections.

Fuel tanks are all-metal, located in wing and

British Postwar Aircraft

nacelles; they have a 750 Imp. gal capacity, which implies, in the case of the 21-seat model, a still air range of 1500 miles at maximum cruising conditions; i. e., 210 mph at 10,000 ft. With full load, the take-off weight is 33,000 lb, which includes a disposable load of 11,375 lb, representing 35.45 per cent of the gross weight and a structural percentage of 31.8 (10,480 lb).

Reverting to the unique wing-to- fuselage attachment, the flexibility feature is gained as follows: The main wing spar passes through the fuselage without attachment of any kind, being free to "float" vertically, though restrained in respect of fore-and-aft movement. At-

tachment of the wing is effected by a system of links running from the leading edge and trailing edge subspars, the links being pivoted on pins with Silentbloc flexible bushings. There is also a "drag beam" secured to the fuselage on each side to relieve the links and main spar from bending loads. Each of these beams has a pilot extension runing into a sliding block attached to the wing root rib. Relative movement between fuselage and wing is obviously strictly limited (mere hundredths of an inch), but it is considered sufficient to eliminate almost completly the transmission of vibration from the wing to the fuselage.

Vickers-Armstrong have had considerable experience of geodetic construction applied to fuselage, tailplane and wings, for it has always been associated with their Wellington medium bomber and certain other aircraft of their design. But in the Viking they have aplied it to the wing, tailplane and fin only and for the fuselage have adopted an orthodox stressed skin structure. Even the wing sections have ailerons of the full Frise type with mass balancing in the leading edge tubes and conventional trim tabs, while a

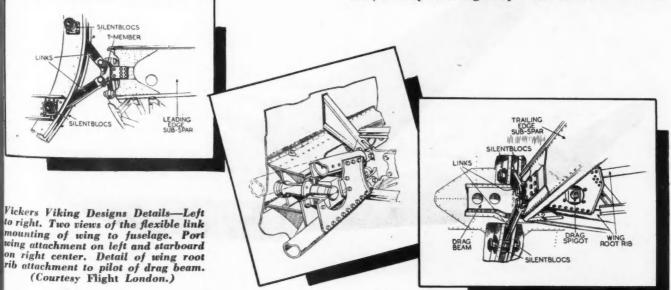
further departure from geodetic practice occurs in the wing panels inboard of the nacelles being metal-skinned, though the outboard panels are fabric covered. The object of the metal-skinned inboard panels is to

facilitate service and maintenance without risk of harm to the outer surface by the ground crew working on either the engine nacelles or on the side of the fuselage.

As indicated above the fuselage itself is a stressed skin construction and it is of note that neither the beaded L-section stringers nor the fluted channel-section frames are notched where they cross one another; instead, the stringers are mounted outside the frames and attached to these by shear cleats. The metal skin is riveted to the stringers; at their horizontal edges the plates are lap jointed, while at their vertical edges a butt joint to an internal strap is employed. The floor of the freight and baggage compartment serves not only in supporting the weight of the contents of the 300 cu ft "hold" but also forms an extremely strong longitudinal and transverse tie for the fuselage structure, thereby resisting compression stresses. External

By M. W. Bourdon

Special Correspondent of AUTOMOTIVE and AVIATION INDUSTRIES in Great Britain



July 15, 1945

, it

TO-

his

etal

ing

and

IES

doors, 44 in. long and 23 in. in effective height, provide direct access to the freight compartment from the ground on each side.

Blackburn Flying Boat

The Blackburn Aircraft Co. is to build what will be the largest flying-boat ever constructed in England. A monoplane, it will have six engines, of an as yet unspecified make or type, mounted conventionally on the wing. The maximum gross weight will be 310,000 lb, or more than six times the weight of the RAF. Sunderland flying-boat. Its wing span will be 202 ft and its wing area approximately 5000 sq ft. There will be several optional passenger arrangements; one of these will provide accommodation for 160 passengers on upper and lower decks, plus space for 30,000 lb of freight. The all-freight capacity will be 91,000 lb.

With a maximum speed of over 300 mph at sea level, this Blackburn flying-boat will have a cruising speed of 270 mph at 15,000 ft. and a range of 2500 miles. With one of the several alternatives in passenger accommodation, it will carry 85 passengers with a still air range of 4400 miles and a cruising speed of 280 mph. All passenger and crew space will be pressurized.

De Havilland "Dove"

A new machine to be produced by the de Havilland Aircraft Co. is to be known as the Dove or DH 104. A prototype is now under construction. Although in flight its outward appearance resembles that of the allwood Mosquito fighter-bomber—also a de Havilland production—the Dove is an all-metal aircraft and planned for use on feeder lines, for charter traffic, executive travel and private ownership. It will carry 8 to 11 passengers.

The Dove is a twin-engined monoplane with Gypsy

Queen engines and retracting nose-wheel type undercarriage. A point of note is that constant-speed feathering and reversible pitch propellers will be fitted. No details of performance have yet been issued.

Miles Messenger

Another new aircraft, of which some particulars have been released recently, may be considered as a simpler and cheaper version of the Miles Mercury, a machine used extensively during the war as an intermediate trainer and for communications. It is known as the Miles Messenger and has already been tested in prototype form. It is intended for use as a club, private or business airplane, light freighter, air taxi, ambulance or trainer. With these purposes in view it has a larger wing area than the Mercury, 191 sq ft as compared with 160 sq ft. Miles retractable auxiliary flaps give a high lift co-officient, and as the wing loading is only 12.5 lb sq ft, the stalling speed is remarkably low, only 25 mph. To enable control to be retained at this low speed three rudders are fitted.

T

duti

tion

pan

Roe

able

sen

The

well

equ

is i

car

The

ing

The Miles Messenger has a 140-hp Cirrus Major (inverted in-line six-cylinder) which, with the fixed undercarriage, gives the machine a cruising speed of 115 mph. The gross weight with a disposable load of 900 lb is 2400 lb. There is accommodation for 34 persons, including the pilot.

Shetland Flying Boat

The British Ministry of Aircraft Production has authorized the publication of some particulars of the Shetland flying boat, the largest British aircraft that has yet flown. It has four Centaurus 18-cylinder engines, the largest of the series of Bristol air-cooled radials with single sleeve valves. Each engine develops over 2500 bhp. With the load appropriate to a range of 4650 miles the gross weight is 130,000 lb



Photograph of a scale model of the Blackburn six-engined flying-boat. Its gross weight is 310,000 lb.

Front and rear views of the Miles Aerovan designed to carry passengers or light freight. It has a range of 450 mph and cruising speed of 110-115 mph. (British Com-

and the cruising speed 184 mph.

nder. peed

e fit. sued.

ulars as a ry, a nternown ested club. taxi, view sq ft

uxi]-

wing

is re-

to be

ed.

Iajor

fixed

ed of

ad of

r 3-4

n has

f the that r encooled e dete to

00 lb

This new machine, originally intended for long-range patrol and reconnaissance duties, is the outcome of the collaboration of two well-known aircraft companies, Short Brothers and Saunders Roe. There are two decks with comfortable accommodation for up to 70 passengers in addition to the crew of 11, There are three main compartments, as

well as a promenade on the aft upper deck, a fullyequipped kitchen and toilet facilities. A feature of note is that two Rotol auxiliary generating plants are carried, each capable of supplying 20 kw at 110 volts. These provide adequate current for all services, including bilging and refuelling. In addition, ample power is

available from these plants for lighting, cooking, refrigeration and air-conditioning, both in flight and at moorings. Besides space for passengers' luggage, freight compartments on the upper deck have a capacity for 6600 lb of freight and mail or other cargo as

needs may demand.

Specification of the Shetland Flying Boat

Dimensions

..... 150 ft. Length overall 110 ft. Maximum height on trolleys..... 39 ft. Maximum beam 12½ ft. Wing loading, gross at 130,000 lb. 49.3 lb/sq ft. Propeller diameter 15.75 ft.

Maximum Tankage

Fuel 6,112 imp. gal. 320 imp. gal.

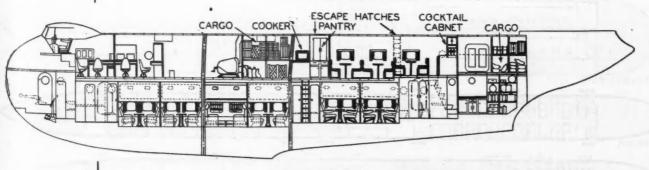
Weights and Performance

Weight empty, but including all services Fuel and Oil 46,525 lb. All-up Weight with 7,620 lb. payload..130,000 lb.

Payload at Various Ranges
7,620 lb for 4,650 miles at 184 mph
22,000 lb for 3,000 miles at 185 mph

30,025 lb for 2,076 miles at 188 mph

Rate of Climb At sea level, full load...... 660 ft/min.



Plan drawings of the "Shetland" showing accommodation for 40 days, or 24 night passengers. (British Combine)

STRIES

HE Model 37 land-based, 204-passenger airliner for overseas operation reflects the serious thought and design ability of many engineers. From its inception many men have contributed their special talents, be it in engineering fields or in the actual construction of its prototype. And too much cannot be said in praise of the many organizations responsible for the development of special equipment and accessories utilized in its construction.

By R. R. Hoover

Model 37 Project Engineer, Consolidated Vultee Aircraft Corp.

The weight of the completed airplane—less fuel, oil, personnel, etc.—commonly known as weight empty will be about 165,-

ooo lb. The design gross weight is 320,000 lb. But despite this weight, the power loading, with its six 5000-hp engines, is approximately 10.7 lb per hp. This is about one lb per hp less than the Liberator bomber. Loaded to its design gross weight, which includes a payload of 50,000 lb—passengers, mail and express—it has sufficient fuel to fly from New York to London with allowance for a 50 mph headwind and for flight to an alternate airport if weather so requires.

Up to a few years ago, the best material for the airframe was relled aluminum alloy-commonly designated as 24ST. Recently it was discovered that the properties of this material could markedly be improved by subjecting it to a controlled heat for a period of time, known as the "aging cycle." This. combined with varying degrees of "cold work," produces several higher strength 24ST conditions, known as T80, T81, T84 and T86, in the order of their respective properties. It has been estimated that over 6600 lb were saved in the Model 37 by their use. These, in combination with new alloys of aluminum and of magnesium, permitted the structural designer to use lighter gages of higher strength materials, their application being restricted only by manufacturing limitations such as severe forming, dimpling, etc. Also, high grade steels, castings and forgings were made available—all contributing to structural strength at less weight than was previously attainable.

In addition, a greater effort has been made to hold the design margins to a practical minimum, frequently little more than 2 to 5 per cent. Of course these small margins require substantiation by static and dynamic tests, as applicable. Past experience, however, has

accumulated a wealth of data which enable the designer to approach each problem with weight saving uppermost in his mind—consistent of course with the structural requirements imposed

fuselage of the airplane are of conventional construction, utilizing metal skin over metal stringers and bulkheads. Thin gage materials, however, are not used. It should be noted that the lower surface plating of the wing varies in thickness to a maximum of % in. All exterior surfaces are attached with flush rivets to keep drag to a minimum.

Model 37

11

di

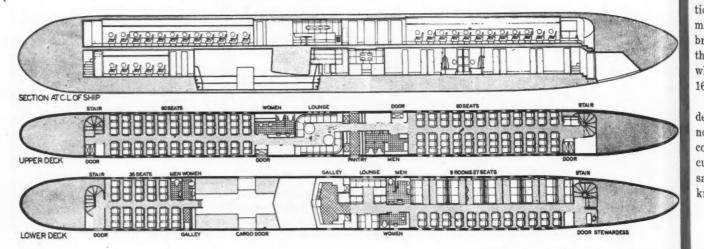
co

J

The power plants, which develop 5000-hp each, are of a new type utilizing low grade fuel. The propellers are 16 ft diam, counter rotating, three-bladed and are arranged to push the airplane through the air Since this airplane utilizes a laminar flow airfoil wing the pusher installation was used to obtain an uninterrupted wing leading edge, thus assuring full utilization of the low drag characteristics of the airfoil.

The fuel is carried in tanks built integral with the wing structure and sealed against leakage by the use

204-Passenger Version of Model 37 Airliner



Model of Convair 204-passenger airliner. The military version of Model 37 is the Army Air Forces' cargo plane, the XC-99, also readily adaptable as a hospital plane or troop carrier. It will have pressurized cabins and a service ceiling of 30,000 ft. A cutaway view of XC-99 is shown on page 92.

were ength

o hold

uently small

namie

, has

le the

veight

nt of posed

l and

l contring-

r, are

irface imum flush

1, are

pro-

laded

e air.

wing,

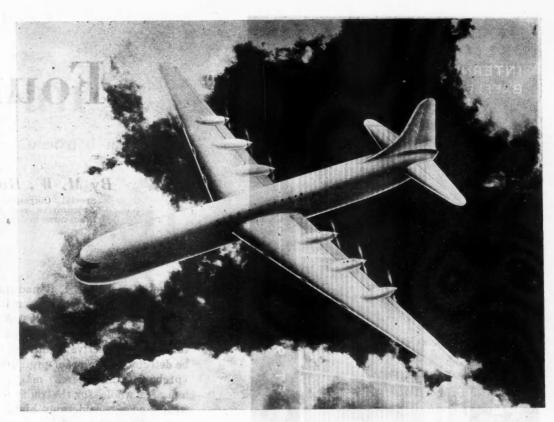
inter-

tiliza-

h the

e use

il.



Airliner Design

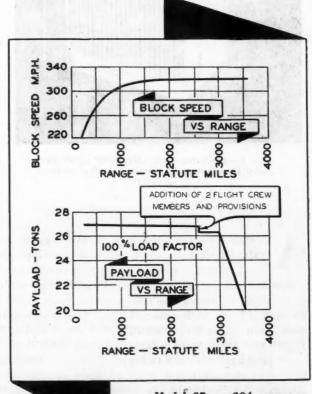
of Neoprene between all overlapping members and plating. There is no fuel tank closer than approximately 6 ft from the fuselage, thus preventing any possible contamination of the passenger compartments with odors of fuel vapor.

The landing gear also is conventional in appearance and construction, though its size is tremendous. The 110-in. main wheel tires, over 9½ ft diameter, alone weigh 2700 lb. The dual nose wheels are 56 in. in diameter. And since the air in all of the tires is simply more weight to be carried, our engineers have considered the use of helium, resulting in a weight saving of 150 lb. This is another step in boosting the all-important payload.

The nose wheels are steerable from the pilot stations, using hydraulic power for their actuation. The main wheels are provided with improved hydraulic brakes which apply a braking force of 82,500 lb with the application of 140 lb at the pilot brake pedals, which means toe control for an airplane weighing 160 tons.

While the cockpit control elements, wheel and rudder pedals are conventional, the control surfaces are not. In order to reduce the high airloads on the large control surfaces to small pilot forces comparable to current airplanes, such as the Liberator, it was necessary to incorporate a comparatively new principle, known as servo tab boost.

With this system, the rudder, for example, is di-(Turn to page 90, please)



Model 37 — 204 - passenger over water day arrangement; cruising altitude, 25,000 ft; maximum cruising power, and 10 m.p.h. headwind.

TRIES

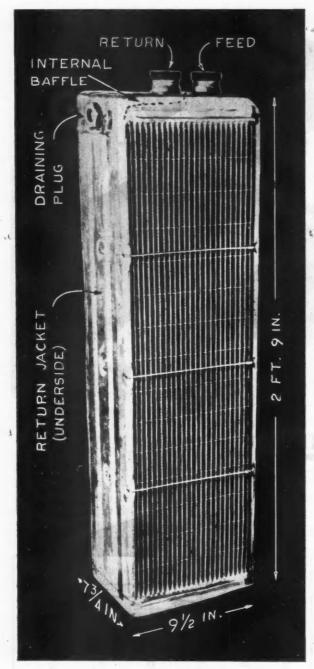


Fig. 1-Radiator from Me 109F with Mercedes Benz engine (shown upended, bottom at left).

REPORT issued by the British Ministry of Aircraft Production deals with the design, construction and materials of four types of radiator removed from German aircraft. Two of these, entirely different in design and construction, were found on Junkers Ju 88s with Jumo 211 engines; another had been used on a Messerschmitt Me 109F, while the fourth was taken from a Messerschmitt Me 210.

Dealing first with the radiator of the Me 109F, this unit was examined and reported upon by the Royal Aircraft Establishment, an experimental and research organization, which states that the radiator in question was made, in general, of commercial aluminum and assembled by welding. Shown upended (bottom

Four Types of G

By M. W. Bourdon

Special Correspondent of AUTOMOTIVE and AVIATION INDUSTRIES in Great Britain

at the left) in Fig. 1, it had finned tubes of oval see tion, the fins produced by machining a solid drawn tube of circular section subsequently flattened.

The coolant used was a 50 per cent glycol-water mixture. No protective treatment of the aluminum could be detected. The proof pressure (nachprufdr) of 0.78 (probably atmospheres) may refer to the coolant system as a whole, for the radiator would be expected to withstand a considerably higher pressure.

This Me radiator weighed 58 lb, with a frontal are of 2 sq ft. The total surface area of the tubes and fins was estimated to be 206 sq ft. These area value compared unfavorably with those of an earlier coppe radiator from the same type of aircraft, which, weigh ing 79 lb, had a frontal area of 1.61 sq ft and a total surface area of 228 sq ft. Chemical analysis of material from the tubes indicated a commercial grad aluminum containing 0.42 per cent of iron as a primary impurity. Diamond pyramid hardness tests gave a value of 31, i.e., of the order expected for fully annealed aluminum.

The cooling block consisted of two banks of 24 full length flattened tubes, one bank directly behind the other. The fins were 0.4-0.5 mm thick and spaced to a pitch of 2.5 mm with a mean depth of about 3 mm

Wa

cro

side Exa tive

wer

and etcl

Ad:

tog

end

fro

con

of

tha

had

in

pro

Ju

ly

We

Ju

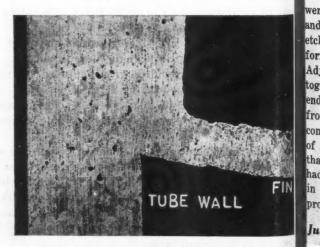


Fig. 2-Section of Me 109F radiator tube wall, showing integral fin and variation in depth of machining cut.

German Aircraft Engine Radiators

Their Design, Construction and Materials

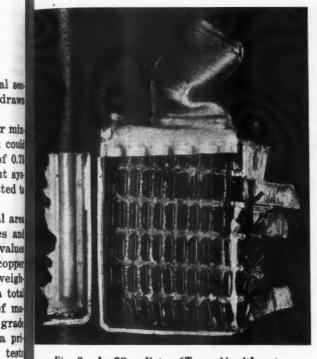


Fig. 3—Ju 88 radiator (Type A) with outer shell removed.

Wall thickness was 1 mm and internal area of the cross section approximately 80 mm by 1 mm. The flat sides were kept apart by two longitudinal interior ribs. Examination of a tube section, cut transversely rela-

tive to the fins, showed that the latter were integral with the tube (Fig. 2), and the grain direction revealed by etching indicated that the fins had been formed by a machining operation. Adjacent tubes and banks were welded together at top and bottom, i.e., at the ends of the tubes. The casing, made from sheet 0.06 in. thick, also involved considerable welding. (At this point of the report an interpolation states that samples more recently examined had an appearance which suggested that in these cases the fins may have been produced by a swaggering process.)

Junkers Ju 88 Radiator, Type A.

As previously mentioned, two entirely different types of light alloy radiator were found on Ju 88 aircraft. The gen-

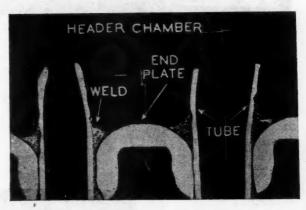


Fig. 4—Section through end plate and two tubes of Ju 88 radiator (Type A)

eral appearance of the earlier of these (Type A), also examined by the Royal Aircraft Establishment, is shown in Fig. 3. It consisted of curved coolant tubes passing through flat fin plates into the headers. The tubes were seamless and of rectangular section with rounded ends, the major and minor axes of the section being about 0.75 in. and 0.1 in., respectively. Deep die marks were evident on the inner surfaces of the tubes.

The fin plates were 0.008 in. thick, dimpled to maintain spaces between them. The leading and trailing edges of the fins had been folded to give stiffness. Tube holes in the fins and end plates had been punched, leaving lips that fitted round the tubes. A section through the end plate and two of the tubes is shown in Fig. 4. The headers to which the end

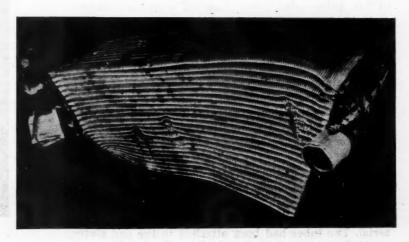


Fig. 5-Ju 88 radiator, Type B, with casing removed.

fully

full-

d the

ed to

mm

FIN

TRIES

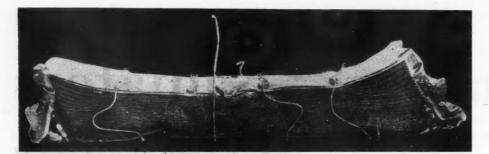


Fig. 6-Radiator from Me 210.

plates had been welded were alloy sheet stampings welded together. The outside of these, also the surfaces of fins and outside surfaces of the tubes, had

been finished with a good quality oleo-resin varnish lightly pigmented with aluminum powder. Judging by its hardness, the varnish may have been given a low temperature bake. Besides affording protection against corrosion, the varnishappeared also to serve as a joint-

ing medium between fins and tubes. When the varnish was removed by a solvent, the surfaces to which it had been applied were dark gray in color. Spectrographic examination gave a strong indication of chromium at the surfaces, whereas the core materials were practically free from chromium. It is presumed that the radiator had been given a protective treatment similar to the MBV process.

Spectrographic analyses of the tubes, fins and sheets showed that the tubes were made of commercial aluminum and the fins and sheets of an aluminum alloy of the Anticorodal type. Diamond pyramid hardness tests made on some of the components gave the following values: Header sheets—47 to 55; Weld material—67 to 71; End plate—24 to 28; and Attached pipes—50 to 55. These values are usual for commercial aluminum and Anticorodal.

Microscopical examination of the various components showed that their structures were consistent with the conclusions of the spectrographic analyses. No corrosion of the materials or the weld metal had occurred.

Examination of the welds on the headers and round the attached end plates and pipes suggested that they had been made with oxy-acetylene, using a filler rod of 10 per cent silicon-aluminum alloy as brazing material. The tubes had been attached to the end plates by "torch brazing," using the same type of filler rod.

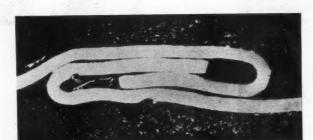


Fig. 7—Section of brass tube from Me 210 radiator.

Junkers Ju 88 Radiata Type B

The second type of 88 radiator is stated by Birmetals Co. (which mathe examination for Ministry of Aircraft P duction and provided report) to have shown to "ingenious and unusubut sound, construction methods had been use The Birmetals report proceeds: "The main designation of the state of t

consisted essentially of 24 aluminum tubes on wh fins 0.125 in. apart and 0.0125 in. thick had been a chined. The tubes had been flattened to a bore of s

> in. by 1/16 in. and ben form an arc equal to proximately one-fifth o full circle. The adjac ends of the tubes welded together and group of tubes welded each end to small fee tanks fabricated fr pressed and welded alum num alloy sheet. Except the ends, the tubes separated from each oth by sheets of foil 0.0035 thick. At some stage in t flattening of the tubes series of uniform and par lel waves had been form

on the fins, probably by pressure."

Offhand, it is suggested in the Birmetals repo (Turn to page 110, please)

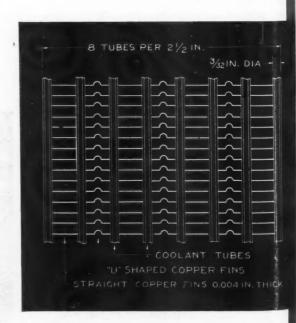
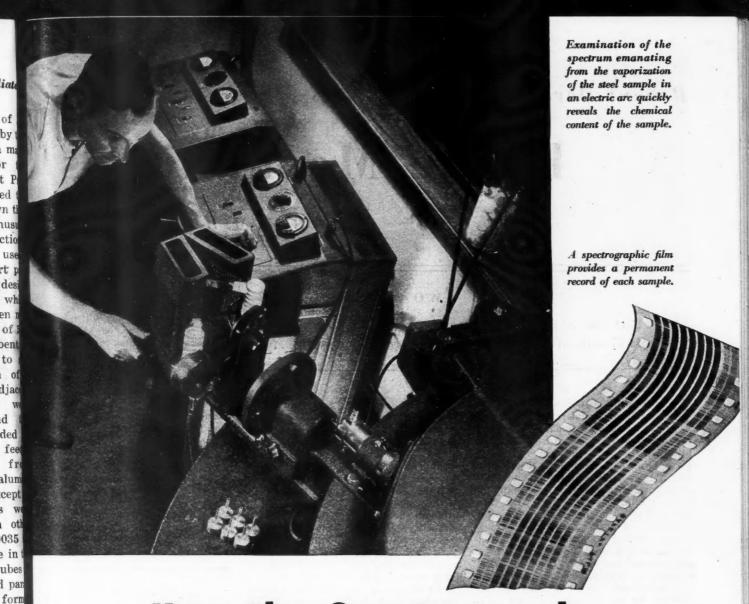


Fig. 8—Diagram showing alternate straight and U-shaped fins of Me 210 radiator



How the Spectrograph Helps Maintain Inland Quality

Every open hearth heat run at the Inland mills is checked not only by routine control methods of chemical analysis, but also in a special spectrographic laboratory.

r t

d

repo

aight

DUSTR

Inland was one of the first steel mills in America to install and develop technique for using the spectrograph in control of quality. An important advantage of this method is the rapidity with which tests can be made. At any stage during the working of a heat a melter can have an accurate check on the chemical content within ten minutes after a sample is delivered to the laboratory. Not only do these frequent and rapid tests assure the uniform high quality of Inland steel, but they also help maintain capacity production—a vital necessity in this time of war.

The spectrographic analysis is only one of the many checks and balances used by Inland in the production of steel —it is only one of the numerous quality control methods adopted by Inland after rigid tests prove their

practicability.

INLAND STEEL CO.

38 S. Dearborn St., Chicago 3, Ill.

Sales Offices: Cincinnati • Detroit • Indianapolis • Kansas City • Milwaukee • New York • St. Louis • St. Paul

Brake Mechanisms

By P. M. Heldt

Part Two

Part One of this article was published in the July 1, 1945 issue of Automotive and Aviation Industries

RAKE ANCHORS-In passenger cars and light commercial vehicles it has become customary to anchor the brake shoes to a pin (or to two pins) fastened to the brake backing plate (Fig. 8). This plate serves primarily to keep dirt and water out of the brake drums, and therefore usually is made of relatively light stock. For this reason it does not provide a very rigid foundation for the anchor pin, which under extreme conditions is subjected to enormous forces. For instance, in a car with a wheel load of 1000 lb., with a friction coefficient of 0.7, if the brakes are locked the frictional force on the tire will be 700 lb., and if the distance of the anchor pin from the axle center is equal to 40 per cent of the effective tire radius, the force on the anchor pin will be 700/0.40 = 1750 lb. This force may be considered concentrated at the center of the brake shoe webs, which may be at a distance of 1 in. or more from the backing plate. Hence the anchor-pin load acts at a sizable moment arm and therefore creates a large moment. The resulting deflection of the anchor pin will cause distortion of the brake shoes, and concentration of load at certain parts of the linings, which is one of the causes of brake.squeal.

Where two adjacent anchor pins are used, their rigidity can be increased by connecting their outer ends by a tightfitting link. The ideal condition, of course, is to have no overhang or cantilever effect at all, and this can be realized by providing a straddle mounting for the anchor pin, by means of two pressed steel disks, bolted or otherwise secured to the axle housing in the plane of the brake-shoe webs. The outer portions of the disks are offset equally in opposite directions, and the anchor pin passes through both of them. One of the disks can be the brake-backing plate.

One way to reduce brake noise is to mount the shoes in such a way that they "float," rather than mounting them pivotally on fixed anchor pins. A float-

ing shoe is one which can move freely in the direction parallel with a line connecting its ends, or its points of contact with the expander member and the anchor. With a pivotal mounting on an anchor pin the shoes must be so adjusted that when they are released, the clearance between lining and drum will be the same at both heel and toe, for although the absolute motion of the toe is much greater than that of the heel, the direction of toe motion is much more inclined to the radial than the motion of the heel, and both approach the drum at the same rate, provided they are at equal angular distances from a diameter through the center of the anchor pin. If, when the brake is released, the clearance were less at the toe than at the heel, "toe contact" would result, whereas in the opposite case there would be "heel contact." When the toe of the shoe contacts the drum first, the resulting friction acts on a moment arm practically equal to the brake diameter, instead of on an average moment arm of about one-half that length, and the self-energizing action therefore is very pronounced. In the opposite case, that of "heel contact," the moment arm of the friction is very short, and the self-energizing action is relatively weak, so that more pedal pressure is required to produce a certain braking effect. If there is any excuse at all for more clearance at the toe than at the heel, it is that the effects

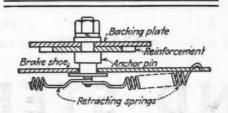


Fig. 8—Conventional method of anchoring passenger-car brakes.

of toe contact are more objectionable than those of heel contact, and the former should be guarded against in every way.

The arrangement by which the brake shoe is made to float between two wheel-cylinder caps, in the Bendin Twinplex brake, has already been illustrated (Fig. 3 in Part I). Bendix had developed also another design of wheel cylinder that acts as brake-shoe anchor As shown in Fig. 9, the cylinder is formed with an internal circumferentia rib at the middle of its length, and contains two pistons which may abut against this rib. With the brake released, both pistons are held in contact with the rib by the retracting springs. When brake fluid is forced into the cylinder, both pistons at first move outward, until the shoes contact the drum whereupon they are being carried around with the drum until the leading around with the drum until the leading around with the drum until the leading the shoes contact the drum whereupon they are being carried around with the drum until the leading the shoes contact the drum whereupon they are being carried around with the drum until the leading the shoes contact the drum whereupon they are being carried around with the drum until the leading the shoes contact the drum until t

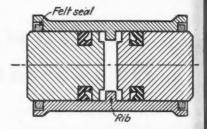
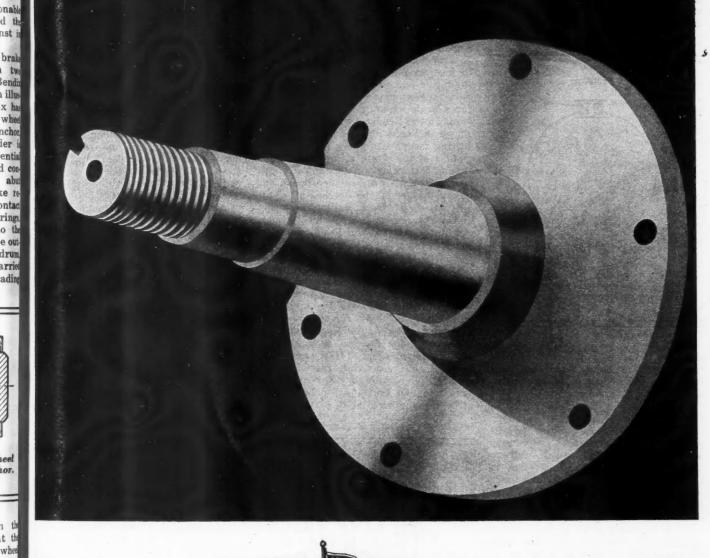


Fig. 9 — Internally-ribbed wheel cylinder serving as brake anchor.

shoe again contacts the rib in the cylinder. It will be noticed that the inner ends of the pistons in the whee cylinder are reduced in diameter, so that they can enter the "throat" in the cylinder with very little clearance. This produces a dashpot effect, for when the piston enters the "throat," the simular space between the cylinder ampiston is filled with brake fluid which because of the small clearance, can escape only slowly. The result is that the piston approaches the rib at a low velocity with no metallic click.

In all of the earlier types of whete cylinder there is a rubber sealing cuback of each piston. In this construction, where the reaction to the frictional force is taken up on the cylinder through the piston, it is impossible to use such a cup, and its place is taken

Molybdenum is an economical preventive of temper brittleness in steel.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



er, s
in the
This
en the
an
c an
which
, ca
s tha
a lov

wheel cup struc-ction-inde

ole t take

TRIE

July 15, 1945 When writing to advertisers please mention Automotive and Aviation Industries

by a sealing ring lodged in a groove cut

DIFFERENTIAL WHEEL CYLIN-DERS—In most hydraulic brakes the wheel cylinders have a straight bore, and contain pistons of equal diameters, so that equal actuating forces are impressed on both shoes. Some hydraulic brakes, however, are made with "stepped" or double-diameter pistons. These have been used with the conventional type of brake, in which one shoe is self-energizing and the other de-energizing, and it is a curious fact that while in one application the arrangement is such that the larger piston actuates the self-energizing shoe, in another it actuates the de-energizing shoe. The

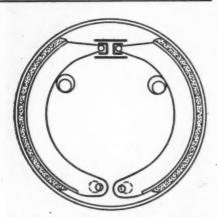


Fig. 10—Double eccentric adjustment used with conventional brakes.

situation, however, is not as illogical as it seems at first sight, for entirely different objects are aimed at in the two cases.

It was shown in the foregoing that in the conventional brake the de-energizing shoe does only about one-half as much work, and therefore wears only about one-half as fast, as the self-energizing shoe. This evidently can be corrected by applying a heavier actuating force to the de-energizing shoe, and that is the object when the de-energizing shoe is actuated by the larger piston. On the other hand, actuating force applied to the self-energizing shoe "bears interest," as it were, for its effect is multiplied in a certain proportion by the self-energizing effect, whereas actuating force applied to the deenergizing shoe is reduced in the inverse proportion. It therefore "pays" to apply a relatively large proportion of the actuating force to the self-energizing shoe, the "payment" being in the form of a reduction in the pedal pressure required for a given braking effect. In brief, when the large piston is made to actuate the de-energizing shoe, it is done to equalize the rates of wear on both shoes, whereas if it is made to actuate the self-energizing shoe, it is done to obtain a given braking effect with less pedal pressure.

BRAKE ADJUSTMENTS-In brakes of the conventional type, with shoes pivoting around an anchor pin or around two adjacent pins, it was usual to provide two adjustments per shoe. One adjustment was by an eccentric contacting or supporting the web of the shoe near the toe end, by means of which the clearance between lining and drum near the toe end could be varied. After such a clearance adjustment had been made it was often found that the clearance at the heel was either too large or too small, hence an adjustment was needed for that end too. This usually was provided by giving the anchor pin an eccentric mounting in the backing plate. This double adjustment is illustrated diagrammatically in Fig. 10.

With floating shoes it is unnecessary to have two adjustments per shoe, as the latter is capable of sliding parallel to a tangent plane to its contact surfaces on the expander and anchor members. In the Bendix Twinplex brake, as shown in Fig. 4 of Part I, the only adjusting means is a screw in one of the pistons of the wheel cylinder. The adjusting screws have notched heads, and locking springs are provided which engage into one of the notches after an adjustment has been made. The heads of these screws are accessible through openings in either the brake drum or the backing plate. In making an adjustment, the adjusting screw is first turned out as far as it will go, when the shoe is in firm contact with the drum, and it is then turned in the opposite direction through the angle required to give the desired clearance.

Bendix also has developed another adjustment for floating shoes, known as the octagon (Fig. 11). It consists of a metal part somewhat resembling a spool, with a small-diameter central section, and end portions which, instead of being cylindrical as in a spool, have

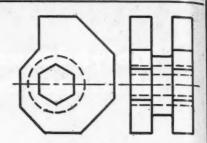
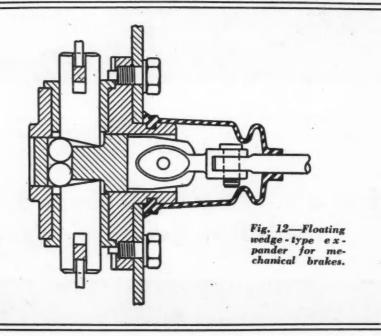


Fig. 11—Bendix octagon brake adjuster.

a series of flat outer surfaces, each succeeding one at a slightly greater distance from the axis of the spool. The central cylindrical portion contacts the web of the shoe, at a slot in its end, and when adjustment has been made one of the flats on the outer portions contacts the plane outer end of one of the pistons in the wheel cylinder. It is evident that with this adjuster adjustments can be made only in definite steps. Moreover, it is impossible to make an adjustment before there has been enough lining wear to call for it, because when the adjustment is being made the edge between successive flats must pass under the wheel-cylinder piston. This edge is farther from the axis around which the adjuster turns than either of the adjacent flats, and if there is not sufficient clearance it will not pass. Adjustment is made by means of a key fitting a hexagon recess in the adjuster.

MECHANICAL BRAKES — In recent years the general tendency has been strongly toward hydraulic brakes, but there is still a certain demand for mechanical service brakes, and firms specializing in the manufacture of brake equipment therefore have an in-



Jul



Pressure-tight and leak-proof assemblies are of vital importance to the efficiency and proper maintenance of trucks, buses, planes, tanks, tractors, boats, diesel engines, pumps, pipelines and industrial machinery.

Permatex Form-A-Gasket No. 1 ... Form-A-Gasket No. 2 ... Aviation Form-A-Gasket and Pipe Joint Cement are as important as tools a mechanic uses to do the right job on gasket assemblies, flange unions, threaded connections, pipe joints and many other assemblies.

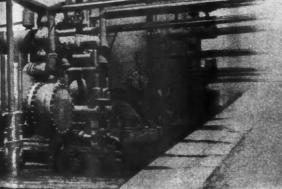
These Permatex sealing compounds are leak-proof to gasoline, kerosene, fuel oil, hot or cold lubricants, hot or cold water, salt water, illuminating gas, ethylene glycol, glycerine and numerous other liquids and gases.

Permatex Form-A-Gasket No. 1 is a soft paste that dries fast and sets hard.

Permatex Form-A-Gasket No. 2 is a soft paste that dries slowly and remains pliable.

Permatex Aviation Form-A-Gasket is a heavy liquid that does not dry and does not run. Readily brushable and self-levelling.

Permatex Pipe Joint Cement is a heavy liquid that does not dry or crack. Applied with a brush. Permits easy readjustment. Disassembles readily.



PERMATEX COMPANY, INC. Sheepshead Bay, N.Y., U.S.A.



IES

d-

sucdis-

The the

and e of

acts

pis-

evi-

ust-

nite to

has

r it, eing flats pis-

axis han nere

not

the

has

ces.

for

of

in-

centive to develop designs of mechanical and hydraulic brakes of which the largest possible number of parts are interchangeable between the two systems. This not only reduces the manufacturing equipment required, but also simplifies the replacement-parts supply problem. In England a number of different designs of mechanical brakes are in production in which the expander mechanism is similar in general form to the wheel cylinders of hydraulic brakes. One such expander mechanism, due to Bendix, Ltd., is illustrated in Fig. 12. The housing is piloted in a hole in the backing plate, and secured to the plate by cap screws. It is bored out tangentially, and bearing bushes are inserted in the bore and secured therein by the attachment screws. Within the bearing bushings there are two tappets, these being cut off at an angle at the inner ends, and slotted at their outer ends for engagement with the webs of the brake shoes. The inner, inclined surfaces of the tappets are hardened, and are acted upon by two rollers, lodged in a transverse

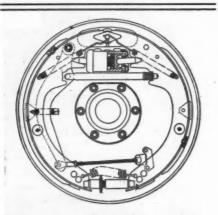


Fig. 13 — Mechanical operating means for hydraulic service brake.

hole in the actuating plunger. A pullrod connects to the plunger through the intermediary of a short link with a double pin joint, giving a universal connection. This part of the mechanism is enclosed in a rubber boot. A feature of this design is that there is no reaction on the housing or body of the expander mechanism due to the actuating force applied to the brake shoes.

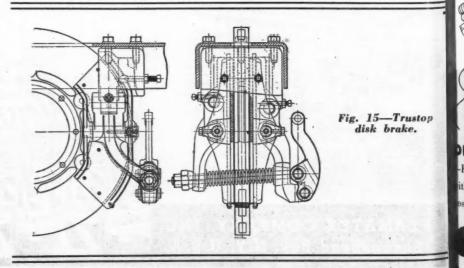
It is now common practice to use the service brakes of the rear wheels also as parking brakes, the shoes being mechanically applied to the drum for the purpose. In Fig. 13 is shown a side view of a servo-type hydraulic brake provided with means for mechanical actuation. A long lever is pivoted to the brake shoe at the left near its upper end. Some distance below its fulcrum this lever connects by a strut to the brake shoe at the right, and at its lower end the lever has a cable connected to it, which passes through a guide secured to the brake backing

Fig. 14—British c o m b i n e d mechanical and hydraulic brake actuating mechanism.

plate and connects to the brake lever through an equalizing device. A pull on the cable evidently forces the upper, free ends of the brake shoes apart, the same as hydraulic pressure in the wheel cylinder.

Fig. 14 shows a combined mechanical and hydraulic operating mechanism of a brake sold in England as the Lockheed by the Automotive Products Co., Ltd. This brake, the same as that of Bendix, Ltd., referred to in the foregoing, has a wedge-type expander, but instead of rollers, two metallic sectors are used to force the tappets apart. The sectors are pivoted on the actuating plunger, and motion is transmitted from the actuating plunger to the tappets by parts between which there is only rolling contact, which reduces losses in transmission and makes for a "light pedal." The pullrod is surrounded by a hydraulic cylinder containing a piston, which latter forms a part of the mechanical hand-brake linkage.

A number of improvements have been made recently also in the Tru-Stop disk brake of the American Chain & Cable Co., which has long been used as parking brake on motor trucks. The gen eral principle of operation remains th same, and the object of the improve ments was to enable a brake of give diameter to absorb and disperse mor Btus per second without injurious effects. Originally the disk of this brake was cast, but in the new design, illutrated in Fig. 15, it is made of two stamped plates of 1035 steel that an riveted to a malleable iron spider. To prevent warpage and runout, the disks are riveted to the spider by two row of rivets-an inner row securing the disks to the spider, and an outer ro which merely holds the two disks to gether, with tubular spacers surround ing the rivets between the plates. Se tor-shaped, ribbed shoes are located of opposite sides of the disk. They an swiveled on levers fulcrumed on bracket secured to a frame cross mem ber. The ends of these levers can drawn together by means of anothe lever and a draw bolt. Adjustment are made by means of the nuts on the draw bolts and the two set screws in the bracket, these latter serving to equalize the clearances at the top and bottom of the shoes.





you've heard the rumors . . .

Dow gives you the

facts



WESTERN



7A 169 NL PD=WASHINGTON DC JUN 6

DOW CHEMICAL COMPANY MIDLAND MICH-

on

is th

rove

give mon us efbrake

illus

t an

disks rows g the row is to ound

Sec

REURTEL RAW MATERIAL SUPPLIES FLUCTUATE MONTHLY AND
THEREFORE WE CANNOT PREDICT FUTURE POLYSTYRENE AVAILABILITY
FOR CIVILIAN USES=
GEO H SOLLENBERGER WPB CHEMICALS.

Polystyrene supply

Contrary to many rumors, polystyrene is not freely available. We wish it were. Apparently you do too.

WPB is working with every polystyrene producer and supplier to make the most material available to everyone as soon as possible. But military needs—which still come first—must be balanced against supply of benzene and production capacity. These factors are uncertain, changing—one thing today, different tomorrow. As the Nation's largest producer of polystyrene, we'd like to be more specific—but obviously can't. You can be sure that we're doing everything possible to meet your needs and anticipate your growing demands: spreading the benefits of every available pound of polystyrene to help keep the nation's employment at the highest level.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland Los Angeles • Chicago

San Francisco • Cleveland • Detroit • Chicago



don't put your molder

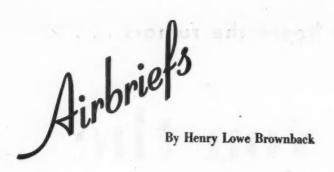
On the spot When you talk to your molder about polystyrene -REMEMBER—war still creates shortages beyond his control. He's working ith us—and will be ready to serve your full peacetime needs at the earliest ossible moment. "Let's Work It Out Together!"

STYRON



PLASTICS

STYRON • ETHOCEL • ETHOCEL SHEETING
SARAN • SARAN FILM • STYRALOY • STRIPCOAT



This Must Stop

I hate to criticize our military services as they have done a job without parallel in the history of war, but some military pilots are, too often, indulging in a practice which, if not stopped, will hurt all of aviation. A most glaring example of the practice of bailing out to save one's own skin without making certain that the abandoned aircraft will not kill many times the number of innocent people on the ground as comprise the crew occurred recently over Philadelphia.

It seems that, making a flight in an Army training two seater from New York to Washington, two officers became lost in a heavy storm and could not find the Washington airport. They turned back toward Philadelphia to try to find the airport there and failed. They radioed that they were over Philadelphia with only five minutes fuel and were bailing out. This they did, landing in a densely populated part of the city. Their abandoned plane smashed parts of half a dozen houses and narrowly missed killing many people. Had it landed in a crowded apartment or tenement house, the loss of life could have been appalling.

In military flying in the field of combat or in preparation for combat it may be necessary to fly in bad weather but, except in a case of life or death, military and other pilots should stay on the ground when the weather prevents them from following a course with certainty by proper instruments.

The British

When the war has been won our present military allies are going to be our toughest competition and particularly the British. Britain must have foreign exchange in order to live and she is going out after it! The British are first class business men and know more about international business than any other nation at present able to do anything. The British engineers are capable, British manufacturers use first class materials made by master metallurgists and their workmanship is superb. Do not be misled by the often slightly "tubby" appearance of their mechanical productions nor the somewhat "gadgety" makeup of them, they are first class in every respect and will give us as I have already said, very tough competition.

Another point to be remembered is, that when Britain's interests are involved an Englishman is always 100 per cent British. Well I remember the Imperial Airways planes, coming into le Bourget, which popped out a little British flag on landing and my good British friends telling me that one traveled on any other plane at the risk of his life. They did this, not bombastically, but earnestly. Every Englishman is sold on the idea that anything British is best and he shows that faith and spreads it. That is why a little island with few natural resources and a rather small population controls an empire and commonwealth upon which the sun never sets and why the "Blitz" could never beat them. No. I am not British nor am I a salesman for British goods. I simply recognize the strong points of this great people and point out to my own country men the fact that we must never underestimate them.

Carburetion

A good old friend of mine in the automobile business once told me that ten cents worth of rubber had saved his company a million dollars in engineering, which may be true. It also may be necessary, with low-priced motor car carburetors and bad fuel, to stick the carburetor on a red-hot manifold to cook the gas, but don't do it with low altitude aircraft engines used in very hot weather. I was at a flying field recently and the owner of a small plane was very much upset as his job, after flying a few minutes close to the ground, became so rough that it almost shook the hands off of the gages. The engine idled and ran up perfectly and held its power for about three or four minutes of flight and then acted up in no uncertain terms. Investigation showed that the engine was fitted with a rather large air muffle combined with an air cleaner on the exhaust pipe close to the carburetor and there was no means of by-passing this muffle. With high test gas the air going into the carburetor and the intrument itself were just too hot. I had this same trouble with some three cylinder engines which we built at Anzani. The plane builders wanted to make the job thoroughly streamlined and housed nearly all of the engine and put a big spinner on the propeller hub so the little engine just starved for cooling air. Added to this a big air heater on the intake and the job would not perform at all Stripping off the cowling and the air heater stopped the trouble.

I have never been "sold" on all of this intake heat as I have driven too many foreign cars without it and which performed admirably. I have a six-cylinder English car of just prewar manufacture which is fitted with two SU carburetors with full mixture control on the steering column but no choke, no hot spot, no air heater, no accelerating pumps or other gadgets. They feed horizontally directly into short intake manifolds of large diameter for high speed. In spite of the fact that engine lacks nearly all of the carburetion "needs" we have heard of, it starts quickly in any weather, idles beautifully and runs slower and faster in any weather than any car engine I have ever seen and gives fine mile-

Truth

I have just read a most inspiring advertisement in an aviation magazine part of which I will quote.

"In a recent release of figures from insurance records we noted with interest that travel by automobile is ten times as safe as travel by personal plane. Being in the aviation industry and looking to the future of private flying, these statistics were thought provoking. It's true, according to Civil Aeronautics Authority that more than 70 per cent of private plane accidents are charged to pilot error. If aviation is to grow and assume the proportions of utility in American life that we dream about and hope for, aircraft designers and manufacturers must realistically approach these facts and ask themselves, why do we design and build ships that give so much opportunity for pilot error?"

Bravo for this advertisement and let's hope that all plane manufacturers ask themselves this question and solve it. Today's planes are not "Every man's" planes to loaf along in enjoying life and capable of landing themselves without considerable hazard except in most skilled hands.

Why?

Why do the manufacturers of some airplanes fail to properly provide drip and overflow outlets for oil, gasoline and grease in engine compartments? All carburetor float bowls should be fitted with overflow tubes leading outside and every point of drip should have a collecting funnel and outboard tube.



July 15, 1945

take

and

with ture t no

, no gets. into iam-

idles ster

gine

nile-

zine

rom

terten onal

stry vate ight Civil han ents tion ions we dealisask wild for and rers olve ery ing ves

in

lrip line its? be outple

ard

IES

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

Factories Now Tuning Up for Peacetime Production of Cars

Contracts for M-26 Heavy Tanks Scaled Down as Trend Toward Lower Output of Tanks and Spare Parts Continues

Slowly but surely the automobile industry is fitting into place the jig-saw patterns of its reconversion puzzle, and the integrated picture of "combined operations" of peacetime automobile production and output of war goods is beginning to take shape. To be sure there still are a great many odd pieces to be filled in, but the overall progress is encouraging. By now most of the companies know which facilities are going to be free for car production and they are going ahead at top speed in

Cutback have continued to dribble in over the past few weeks, and another fairly heavy re-adjustment in war schedules is reported to be on the way. By the end of July, the overall reduction in war production nationally will probably be about 25 per cent, and in Detroit may be slightly higher than that. Even so, if the war with Japan does not end before next spring or summer, the total reduction is expected to be down only to 45 per cent by July 1, 1946. However, it must be remembered that these estimates are based on many imponderables, and while undoubtedly made in good faith, are subject to the unpredictable factors which might alter the picture considerably one way or the other. The general thinking now is that reduction in munitions will be heavier than currently anticipated, but an unfortunate turn in the military situation could work havoc. Some of the industry leaders point out that last summer war production fell off when it seemed evident that Germany would fall in a few months, and a parallel situation might develop in the war with Japan. On the other hand, they are not discounting the possibility that the war might end suddenly, throwing the entire economic structure of this country out of joint, at least temporarily.

The trend toward lower production of tanks continues with the scaling down of the General Motors contract for M-26 heavy tanks at the Grand Blanc plant of Fisher Body Div., with complete termination by next April. This tank the newest and largest to be announced by the Army, was used successfully against the large German tanks, but apparently there is some relief in Army circles that it will not be required in such heavy volume against the Japs. The readjustment in schedules will lop off about 3000 tanks and a

large number of spare parts with a total value of more than \$211 million. Although the Army has made no comment, it is understood that production of the M-26 will continue at the Chrysler tank arsenal. Ordnance also has announced that negotiations are under way for additional contracts for combat vehicles at the Grand Blanc plant. About the only net gain to General Motors so far as reconversion goes, is that labor released has been grabbed up for construction work on the various projects the corporation has under

way at Flint, where it is building sereral new structures for Buick, Chevrelet, and Fisher Body.

Willys Overland has been notified of cutbacks in its 155 mm. and jeep production contracts and termination of bullet core production. The jeep cut back will serve only to increase the number of civilian jeeps and commercial vehicles which the company is reported planning to produce on the same assembly line with army jeeps. No plant space will be made available by the bullet core cancellation, however, since the Army has ordered the plant put in stand-by condition for use in case of emergency. This stipulation underscores the uncertainty, even in the minds of the military, about the course of the war. Willys, incidentally, i planning to hold a press preview of its postwar line of jeeps on July 17 and 18, indicating that it will have little difficulty in getting into production. (Turn to page 120, please)

Easing of CMP Restrictions Fails to Speed Steel for Civilians

Prevailing Conditions have Intensified the Disparity Between the Output of Semi-Finished and Finished Steel

By W. C. Hirsch

Termination of some of the Controlled Materials Plan restrictions has so far failed to speed up the flow of the most urgently wanted descriptions of steel into civilian consumption. Neither producers nor consumers are banking too heavily on the supposed advantage resulting from the privilege of high priority products markers to accept delivery of validated contracts even though cancellations by the military authorities seemingly free the material and make possible its diversion to civilian end-uses. All that the steel-hungry civilian goods manufacturer can do is to keep his fingers crossed and hope that no emergency regulation will be adopted to upset the apple cart. War and Navy Department calls for the very gages of sheets and other descriptions of finished steel, that are essential in the rehabilitation of the automotive industries, are reported to have been rather heavy in the last few weeks. Prevailing conditions have intensified the disparity between the output of semi-finished and finished steel. Finishing mills suffer more acutely from man-power shortage than do those that turn out bars, billets and slabs and high temperatures have made further inroads into the daily yield of continuous rolling mills. In other words, there is much more semi-finished steel available than can be rolled into sheets and strip Medium diameter seamless tubes are in a class with sheets in this respect.

Attorney General Biddle's plea for the extension of West Coast steel capacity was passed over in the market without much comment from steel industry leaders. Only the end of the war with Japan can bring out a dependable picture of peacetime market potential of the Pacific Coast territory, so that aside from all other arguments, that of poor timing of the Justice Department's recommendations is pointed to

Ending of the Bolivian tin contract on June 30 did not affect deliveries, settlement being put on a day-to-day basis until a new agreement can be reached. The Bolivians are expected to make further efforts to have the Foreign Economic Administration grant them an increase in the 65-cents per pound price now received by them, but as the maximum selling price is fixed at 52 cents a pound for Grade A refined tin, the out-of-pocket loss to the Government on 30,000 tons annual imports is estimated to run as high as \$10 million. The Bolivians are anxious to obtain as much

(Turn to page 86, please)

BOSSES

g sev.

fied of

p pro

ion of p cut

se the

nercia

ported assem-

Space

bullet

e the

ut in

ise of

1nder

n the

course

ly, is

of its

little

irity teel

olling

much than strip. re in for l caarket el in-

war lable ntial that

at of

art-

tract

set-

hed.

Ecoan orice axients

the t on ated

The

uch

RIES

In die castings, tapped bosses form stronger fastenings than integral threaded studs and provide convenient mountings for mating parts.

Strength of bosses is greater because they are usually larger in diameter than studs and because external threads cause a notch effect under shock loads.

Boss holes in zinc alloy die castings usually can be cored to tapping size. Tap and chip clearance should be provided below the last thread in blind holes. A chamfer cored at the hole entrance facilitates tapping. Where bosses join the body of the



casting, at least a small fillet is desirable.

This drawing of a zinc alloy die casting for the above parking meter illustrates the utility of bosses for attaching mating components. Most of the 17 bosses are cored and 10 are tapped.



DESIGNING FOR DIE CASTING

The above information on bosses was taken from our booklet DESIGNING FOR DIE CASTING. To insure that you will get the most for your die casting dollar, ask us—or your die casting source—for a copy of this booklet.

The New Jersey Zinc Company, 160 Front St., New York 7, N. Y.



The Research was done, the Alloys were developed, and most Die Castings are specified with

HORSE HEAD SPECIAL (... 29.5

99.99+% Uniform Quality ZINC

destained for the destate

First Ford Off Line Two Days After Production Was Authorized

Much of the War Goods Program of the Company had been Cut Back or Cancelled Prior to End of European War

When Ford Motor Co. drove its first 1946 model Ford off the Rouge plant assembly line on July 3, the second day after resumed production was authorized by WPB, it confounded forecasters who had predicted that no new cars would be made for at least 60 days after "Go Day." While the feat certainly is a credit to the production department of the company, there also were several factors involved in the Ford picture that did not apply to some of the other automobile companies.

In the first place, practically all of Ford's war work was in munitions for the European war. As a result of military progress in that theater, much of the war production program at the company had been either cut back or cancelled prior to V-E Day, and after final victory was reduced to a point which made partial and quick reconversion action possible. There still is some war work at the Rouge, and at some of the branches, but the plant at the start of production was about 35 per cent reconverted. Asked about contract termination and removal of machinery, a Ford spokesman said these were "normal."

For several weeks before July 1, Ford had a large crew at work shifting machinery into facilities cleared of war work. The physical problem involved moving and re-installing more than 20,000 machines, which ranged in size from small lathes to huge presses weighing as much as 150 tons. In the forge shop, which is 90 per cent reconverted, it was necessary to handle more than three million tons of machinery, dies, and other equipment. The problem was complicated by several small war production jobs still in the shop. Rather than wait for termination of these, the company went on around them and installed automotive equipment in the cleared areas.

Another feature peculiar to the Ford organization is that it has one of the most complete tool rooms in the country. This accounted in large part for the lack of delay in getting re-tooled. The company also has its own steel mills and foundries, which obviates the factor of delivery of steel and castings.

Probably one of the most important factors contributing to Ford's early start is that when production ceased on Feb. 7, 1942, the company had in stock and in the hands of suppliers, enough parts in process for 40,000 units—more than its present allotment for the last half of this year. Some of these parts required only one or two machining operations before being completed, so

the company, with an eye to the future, assumed the cost of having the supplier hold on to all possible components. It is largely these parts which are going into the first cars. According to officials, there is enough material in sight now to complete the initial quota of 39,000 cars. They are non-committal, however, on how long they will be able to continue to use bright work on new cars in view of the critical supply situation existing in nickel and chrome.

Also, only four tires will be furnished with each car at the outset.

Company spokesmen concede the when production gets heavier, bottle necks probably will develop in son components, but they are confident that they will be able to get these, even they have to produce them themselves Present suppliers are furnishing part at 1942 prices, but in some cases under agreement that an adjustment will h made later in the event that OP raises the ceiling. Officials of the com pany state that the first cars will h stored or possibly put on consignment with dealers, but that none will be sol to the public until an application for increased prices has been acted upon by OPA. They say that labor cost have increased 25 per cent and that th appeal for higher prices was based of the same formula used earlier for de termining truck price increases, but re (Turn to page 86, please)

Army Air Forces Request for Appropriations Indicates Trend in Military Aircraft Needs

The Army Air Forces request for appropriations for the fiscal year 1946 recently approved by Congress gives some idea of what is ahead in military aircraft procurement during the coming months.

It was revealed that since April 1, two cuts, totaling 43,792 airplanes, have been made, with a net saving estimated at \$7,590,000,000. The net result is that AAF has financed fiscal year 1945 and will finance the current fiscal year from funds appropriated prior to fiscal year 1945 and at the same time, will transfer a net amount of \$7,200,000,000 to other War Department appropriations.

Airplane requirements for the current fiscal year are approximately one-quarter in number and considerably lower in total weight than those in the fiscal year 1945 estimates. Dur-

ing the fiscal year just closed complet airplanes, spare engines and spar parts constitute approximately 70 per cent of total requirements, while in the fiscal year 1946 estimates this equipment accounts for or slightly over 35 per cent of total requirements.

This percentage decrease in air planes is predicted on the fact that many of the required types of aircraft for use in the Pacific are already order, plus the fact that spare engine and spare parts are well distributed and are available now for more concentration than heretofore. Requirements for other equipment and supplies will not decrease proportionately.

The 1946 appropriation include funds for 600 jet-propelled planes, a well as the standard types of aircraft to be used against Japan.

It was revealed also that although

Illustrating the trend in estimated weighted unit costs per pound of air frame weights for various models this table was presented to Congress by Brig. Gen. L. W. Miller:

Estimated weighted unit cost per pound of air frame weights! for various models, comparing latest formal contracts and quotations with budget estimates as submitted for fiscal years 1944, 1945 and 1946

	Estimated Cost per Pound of Air Frame Weight					
and the same of th				Budget Estimate	dget Estimate	
MODEL	Latest Formal Contract	Latest Quotations	Fiscal Year 1946	Fiscal Year 1945	Fiscal Year 1944	
B-29 B-17 ² B-24 ² A-26 P-47 P-51 C-54 L-5	\$8.06 4.65 5.60 6.37 6.31 6.71 7.89 7.47 6.30	\$5.22 4.01 4.01 5.98 6.31 5.93 6.45 7.16 5.20	\$4.82 5.11 6.16 5.37 6.90 6.58 5.00	\$8.31 5.65 5.89 7.81 6.88 6.46 7.26 6.20	\$15.18 7.24 10.21 10.99 8.59 7.41 10.03 9.78 8.70	

¹ The above costs per pound of air frame weight per Budget estimates for the fiscal years 1944, 1945, and 1948 ar weighted according to total costs of all manufacturers for each model included in the respective year's estimate. For comparative purposes, the costs shown above for the latest formal contracts and latest questions are weighted according to quantities in the fiscal year 1946 Budget estimate.

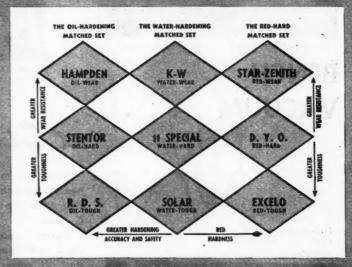
The above latest formal contract and latest quotation cost per pound of air frame weight for B-17's

5 WAYS This Diagram Helps You Boost Output and Cut Tool Costs...

Hundreds of Tool Engineers use the Matched Set Method to get better tools that cut production costs. The steels shown on this Diagram will solve 90% of your tool room problems.

The Carpenter Matched Set Method Gives You These Advantages . . .

- With the Diagram as a guide, it is easier to select the proper tool steel for a job.
- If a tool steel fails to meet the job requirements, the Tool Engineer knows where to go on the Diagram to correct the trouble.
- Tool steel inventories are reduced and simplified because there are fewer steels to use.
- Heat treating problems are minimized by using only a few steels.
- New men on the job can get better results faster when they have this definite system to follow.



ALL THIS PIUS

the fact that simplified selection and heat treatment of tool steels means tools that stay on the job longer and cut production costs.

How To Put This Method To Work On Your Tool Steel Problems...



that bottle some it that even it selves part under

vill b

e con

n men e sold n for upor costs

at the sed or de out re

n plete

spare

0 per ile in this

ove:

air.

rcraft

dy or

buted

quire

supately.

ough

Gen.

and

RIES

Ask for your copy of the Carpenter Matched Tool Steel Manual, free to tool steel users in the U.S. A note on your company letterhead, indicating your title, will start the Manual and its 80-page Tool Index and Steel Selector on its way. Use your Manual to simplify tool steel selection and get better heat treating results. Write today.

THE CARPENTER STEEL COMPANY 103 W. Bern Street, Reading, Pa.



The following table indicates an extensive research and developmental program in connection with airplanes and their equipment and accessories, including the operation of plants for this purpose during the current fiscal year:

	Actual,	Estimated	Estimated
	Obligations,	Obligations,	Obligations,
	Fiscal Year 1944	Fiscal Year 1945	Fiscal Year 1946
n. Purchase of complete aircraft.	3,911,807	\$74,602,885	\$52,000,000
b. Purchase of designs, etc.		3,228,361	5,445,000
Purchase of aircraft propellers.		3,727,425	3,750,000
I. Purchase of experimental aircraft power plants. Purchase of aircraft armament. Purchase of aircraft equipment. Purchase of aircraft cameras.	3,670,735 5,456,462	15,613,640 3,248,395 7,580,156 367,291	13,500,000 4,600,000 9,400,000 690,000
Purchase and maintenance of machinery, test equipment, and laboratory apparatus.	4,675,036	7,489,210	8,240,000

Battery of four 30 H.P. Spencer Vacuum Producers



collect the dust.

BENCH **VACUUM**

Individual vacuum tools for each operator.



Now vacuum is piped overhead to assembly and inspection benches at Sperry Gyroscope.

Vacuum tools of various sizes and types, with handy shut off valves remove dust and metal particles instantaneously without blowing dirt onto operators or the work.

All debris is deposited overhead in a giant separator, situated next to batteries of four thirty horsepower vacuum producers. The same equipment is used to clean floors, walls and overhead pipes.

Ask for information on Spencer Vacuum Bench

E

THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

only one C-82 is in operation and that is on tests, AAF believes that it will be a very good airplane and intends continue production.

Although no funds were requested for maintenance of stand-by plants Air Forces officials said that it planned to maintain approximate nine plants on a stand-by position None of these plants will be evacuate until some emergency arises, but wi be turned over to the aircraft industr under an as yet undetermined program
AAF headquarters would not releas the names of the plants.

Plans for the fiscal year 1946 cal for \$99 million for the operation modification centers as compared with \$122 million last year. Seven modified tion centers are to be retained. Mod fication centers at Cheyenne, Wyo, Louisville, Ky.; Baltimore; Niagan Falls, N. Y.; and Oklahoma City, Okla are expected to be closed before Sent 30.

The production of the B-32 at the Government-owned plant at Fort Worth is to be suspended before th end of the calendar year, but the plan has another airplane schedule and wi not revert to standby condition.

New ASTM Officers

New officers of the American Society for Testing Materials, whose terms be came effective at the close of the annua meeting held in New York, N. Y., in clude as president, J. R. Townsend, m terials engineer, Bell Telephone Lab oratories, Inc., New York, N. Y.; via president, T. A. Boyd, Head, Fuel De partment, Research Laboratories Divi sion, General Motors Corp., Detroit Mich.; and the following five member of the executive committee: John I Freeman, Jr., L. J. Markwardt, Carton H. Rose, L. P. Spalding, and Wi liam A. Zinzow.

Benjamin Briscoe

Benjamin Briscoe, 78, pioneer auto mobile builder and former president the Maxwell-Briscoe Motor Co., which later became part of the Chrysler Corp. died June 26 at his home in Dunnellon

PERSONALS

General Motors Corp., Cadillac Motor Ca Div., Charles H. Smith, Asst. Div. Comp troller; Saginaw Malleable Iron Div., James H. Smith, Gen. Mgr.; B. A. Dollens, Mg of Battery Operations of Delco Remy Div. Aeroproducts Div., W. J. Blanchard, elected president of Dayton Chamber of Commerce Fisher Body Assembly Plants, L. T. Dalecke

Gen. Factory Mgr.
Littelfuse Incorporated, Russel G. Akin

Littelfuse Incorporated, Russel G. Aka Director of Sales and Advertising. The Reliance Electric & Engineering Co. A. S. Knoizen, elected director. The Crosley Corp., Frank A. Schotters Vice-Pres. in chg. of production. Detecto Scales, Inc., Davis S. Hammer (Turn to page 84, please)

Pennsalt EC-10 does a quick, thorough job

Oils, greases, metal chips and shop dirt are quickly removed from steel bomb fuse plugs in the precleaning process with Pennsalt EC-10. Pennsalt K-7 is used in the subsequent Anodic Cleaning process.

ids t leste lant it i

natel uate t wi ustr gran eleas

6 cal

on of wit

difica

Mod Wyo.

agar Okla

Sept

Fort

e th plan

d wi

ociety ns be nnu

7., in

Lab vice

el De

Divi

etroit

mber

Carl Wil

auto

ent o

which

Corp.

ellon

Jan

Mg Div.

alecke

g Co. otters

mer

TRIES

t

This combination makes it possible for each eight hour shift to produce an aver- chi age of 9700 fuse plugs with only 1/10 of 1% rejects - a step up in production of 15%.

The following is the actual case history of this operation.



PENNSALT EC-10 AND PENNSALT K-7 CLEANING PRIOR TO ZINC PLATING AND IRIDITE DIP PROBLEM

To clean steel bomb fuse plugs free of oils, greases and filings prior to zinc plating and subsequent "Iridite" dip coating. EQUIPMENT A 200 gal. solvent dip tank followed by a spray rinse and a 325 gal.

reverse current alkali cleaning tank followed by a dip rinse tank.

PART I - PRECLEANING

1. Use Pennsalt EC-10 concentrated, room temperature; soak for 2. Cold water spray rinse.

PART 2-ANODIC CLEANING

- 3. Use Pennsalt K-7 at 50 to 100 amps./sq. ft. at 8 oz./gal., 200° F. 4. Hot water rinse.
- 5. Muriatic acid dip.
- 6. Cold water rinse.
- 7. Zinc Electroplate.
- 8. Hot water rinse.
- 9. Hot "Iridite" dip and then dry air.

Special Chemicals Division Products

SHOP DIRT OFF

Acid-, Alkali-, and Solventproof Cements • Lead Fluoborate Concentrates • Fluoboric Acid . Acid, Alkali and Solvent Emulsion Type Cleaners • Paint Strippers · Pickling Agents.

SPECIAL CHEMICALS DIVISION

NSYLVANIA ANUFACTURING COMPANY

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

YORK . CHICAGO . ST. LOUIS . PITTSBURGH . CINCINNATI . MINNEAPOLIS . WYANDOTTE . TACOMA



"THE PENN SALT MAN" FIRST A TECHNICIAN ... THEN A SALESMAN

Penn Salt's Special Chemicals Division men are well trained in the application of chemicals to industry's problems. If you have a metal cleaning problem, don't hesitate to seek the advice of "THE PENN SALT MAN." He will advise you with-

New Production Equipment

A ROTO Shaving machine primarily for finishing the back face and bore of automotive rear axle ring gears has just been announced by National Broach & Machine Co., Detroit, Mich. This Roto Shaving operation replaces the green grinding of the two named

locating surfaces prior to the gear cutting operation. The machine may be used with equal effectiveness to finish pressure plates, internal ring gears and other parts. Cutter heads can be made for a variety of special applications.

By way of explanation, Roto Shav-



National Roto Shaving machine

ing is a rapid, close tolerance grafinishing operation for circular, flange cylindrical and conical parts white would otherwise have to be grown. The complete cutting cycle on lar truck ring gears both back face a bore is approximately 15 to 20 second and, of course, considerably less passenger car gears. Approximate 3000 to 4000 parts can be Roto Shawbefore the cutters need regrinding the basis of removing up to 0.15 in from the diameter of the bore. But back face and bore are shaved simultaneously to tolerances required faccurate gear generating.

MODEL 275, a six-spindle turret a tachment for drill presses m available for delivery by Madco Pm ucts, Inc., New York, N. Y., feature an indexing depth stop designed to our control of the control of t



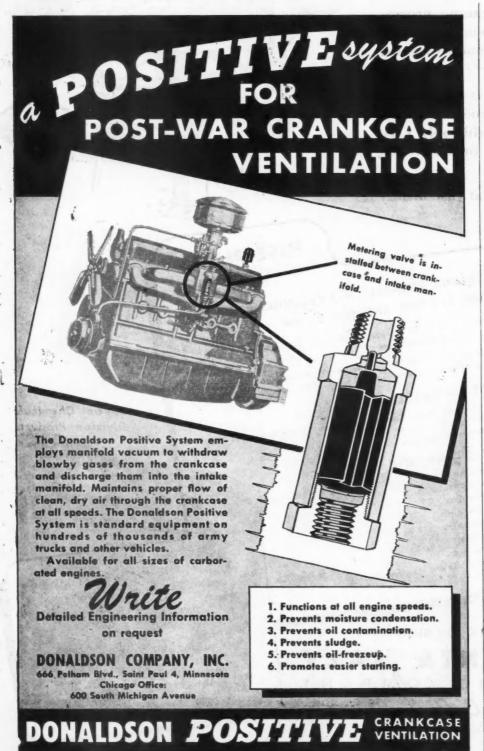
Madco turret attachment for drill presses

trol the drilling depth of each of six spindles of the turret head.

The depth stop mechanism, which completely enclosed, comprises a cyldrical drum carrying six adjusts stops which are easily position through an opening in its aluminum loy housing. The drum is geared the turret head and automatically

(Turn to page 52, please)

Ju





Welded Steel Tubing



Available in commercial mill lengths or cut to specified lengths, shaped and fabricated ready for assembly.

Michigan welded steel tube can be flanged, expanded, cold drawn, fluted, flattened, bent, coiled, upset, beaded, grooved, rolled, spun, threaded, tapered, and shaped to meet every manufacturing demand.

Engineering advice and technical help in the selection of tubing best suited to meet your needs.

Michigan STEEL TUBE PRODUCTS COMPANY

MORE THAN 25 YEARS IN THE BUSINESS
9450 Buffalo St. • Detroit 12, Mich.
FACTORIES: DETROIT, MICHIGAN and SHELBY, OHIO

DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. I.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

rine

Hange White ground language ace an second

less of

ding of 0.15 ind 0.1 e. Bot simulated for

es no Profeatur

· drill

of t

which a cyli ljustal

inumicared cally

USTR



dexes when the turret head is turned. Thus an adjustable stop is brought into control position when its corresponding turret spindle is indexed to operating position.

A SIMPLIFIED Jiffy-Jig, Model J-10A, for use in one position only has been brought out by Monarch Governor Co., Detroit, Mich. Where only a vertical set-up is needed, it is readily adapted to various machine tools for drilling, milling, grinding, boring, etc.



Monarch Jiffy-Jig

Jiffy-Jig consists essentially of three parts—a cap, a base, and an operating lever, the taper of the cap conforming to that of the collet. With the proper size collet in place, the cap is screwed down on the base until the collet open and closes as desired. The operating lever is then screwed into convenient location and the device is ready to use

Electrode for Welding Jet Propulsion Engines

Latest product of Arcos Corporation, Philadelphia, Pa., is an electrod for welding the metals developed for jet propulsion engines.

The electrode is said to produce a weld metal that withstands the great temperatures and stresses encountered in jet propulsion engines.

Although the chemistry and physical properties of this new weld metal cannot be revealed publicly, Arcos Corporation is prepared to supply this electrode for those manufacturers engaged in this program.

DAVIS AND THOMPSON CO., Mi waukee, Wis., has designed an built a 24-spindle horizontal continuous drilling machine, the Type 2H Row Matic. This machine was developed to fill a need for a high production machine capable of drilling identical a similar parts, parts that require drilling from both sides or parts that require a drilled hole from 7 to 12 in deep.

When deep holes are drilled from both sides, completely through the word piece, drills are fed by means of a car so that the feed on one end carries drill to within approximately % in. of the

(Turn to page 56, please)

can have it, *too

PROTECTION OF CONSTRUCTION

urned, ht into Spond

odel n only, Gov. e only eadily ls for

g, etc

three

rating

rming

rope rewe opens

rating

enient

o use

rpora

ctrod

d for

uce a great

ntere

ysical

1 car

Corpo elecgage

, Mil

l and

Rote

ped to

n ma drill at n

from work a can drill

of th

TRIE

G-E STANDARD Tri-Clad Induction Motors Now Available to 2000 hp

For that important big drive (up to 2000 hp, 1800 rpm) you can now get a G-E standard Tri-Clad induction motor. All the protective features that have proved so valuable to service continuity and long life in the more widely used sizes are included:

EXTRA PROTECTION FROM PHYSICAL DAMAGE

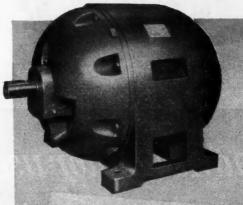
-Cast-iron construction with upper portion completely enclosed to keep out falling objects, dripping liquids. Streamline, cast-iron end shields. Corrosion-resisting finish.

EXTRA PROTECTION FROM ELECTRICAL BREAK-DOWN—Windings of Formex* wire are solidly bonded with synthetic resins strongly resistant to heat, oil, and moisture. Formex wire insulation stands up strongly under abrasion or "heat-shock."

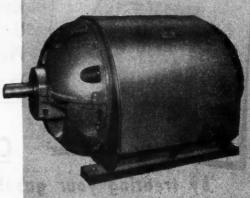
EXTRA PROTECTION FROM OPERATING WEAR AND TEAR—Available with either sleeve or ball bearings—in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad motor bearing proportions, efficiently lubricated, with "air seal" to insure oil tightness of the housing.

The Tri-Clad, in its wide range of types and sizes, is G.E.'s most widely used (integral-hp) motor. Chances are that there's a Tri-Clad to meet your requirements "on the nose." For information on General Electric's complete line of Tri-Clad motors, ask for GEA-3580. General Electric Company, Schenectady 5, N. Y.

*Trade-mark reg. U.S. Pat. Off.

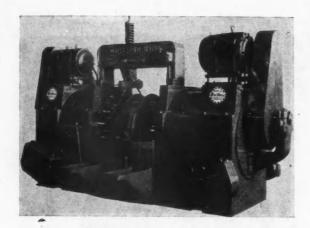


Typical large-size sleeve-bearing Tri-Clad poly-phase motor, now standard up to 2000





GENERAL % ELECTRIC



Type 2H Roto-matic

center line of work piece. The dril from the opposite side feeds beyond the center line to complete the hole. Start, ing drill backs out while hole is being completed.

Two 20-hp motors constitute th driving force for the drill spindle while the motor on the left side also rotates the mandrel fixtures and spind housings. This arrangement provide for the continuous operation of the machine.

PURILICATIONS

A new engineering bulletin describing t new Tension Lock Control manufactured harns Controls, Inc., has been announced The bulletin contains an engineering drawing, complete specifications and description of its operation.*

Reliance Electric & Engineering Co. ha announced the publication of an instruction sheet, No. 3042, covering the grease lubrical tion of anti-friction bearings in Reliance AC and DC motors, V-S Drives and M-G sets!

The Comparative Foundry Characterist

tics of Aluminum, Magnesium and Bronz Alloys, a booklet published by the Eclipse Pioneer Div. of Bendix Aviation Corp., pre sents an analysis of the foundry technique used with these non-ferrous alloys. tains practical information on melting and pouring procedures; gating, risering and chilling problems; core and molding sand; and on baking temperatures.

Air Reduction has issued a new electrode catalog, containing a combined electrode selector chart and index, illustrated sections on Mechanical Properties and Testing and on Approvals. The entire line of Airco Electrodes for welding mild steel, alloy steels, stainless steels, galvanized sheet steel, aluminum and other non-ferrous metals and for hardfacing is covered with complete descriptions and details of applications, weld-ing procedure, mechanical properties, chemical analyses and specifications.*

A new 16-page catalog released by The Wellman Bronze & Aluminum Co., on nonferrous metals, contains tables covering relative weights of structural metals; physical and mechanical properties of cast metal; chemical compositions and mechanical properties of magnesium-aluminum

chanical properties of magnesium-aluminum and copper-base alloys and Ampco Metal; conforming specifications, etc.*

New Departure Div. of General Motors Corp., has announced a new book in its series of treatises for designers, on the fundamentals of ball bearings—entitled Bearing Application. It contains 78 drawings and charts and a clear and orderly description of among other subject the met. scription of, among other subjects, the most important fundamentals of bearing mounting applicable to all types; preloading methods, their effect on housing fits, the effect of press fits on preloading, the effect of preloading on bearing life, bearing creep, the use of duplex, shield and sealed bearings, etc.*

BullDog Electric Products Co. has issued Catalog 451 on Safety switches, light and power panelboards, switchboards and bus duct systems.4

The Bristol Co. has published a folder, Bulletin No. OP1502, describing a newly developed machine running-time recorder. It gives information regarding principle of proportion and proposed to the proposed t operation and method of use and contains typical chart records.*

The Vortox Co. has issued new catalogs on their Types G and GA and Types S and SA Triple Action Air Cleaners. Besides demodels and accessories, the catalogs contain full data on selection of the proper size cleaner for any internal combustion engine or air compressor. Illustrations and dia-(Turn to page 58, please)

advise motor users: Keep Valves, Guides, Upper Cylinder, Pistons, Rings Oiled

by treating your gasoline with

LUBRI-GAS

there's NOTHING else like it!

No mechanical system has ever been invented that assures constant, adequate lubrication of valves, guides, upper cylinder, pistons, rings. That is why sticky valves, burned and pitted valve seats, worn rings, and carbon and gum accumulations in upper cylinder are usually the first symptoms of motor trouble. Lubri-Gas Laboratories have developed an exclusive method of chemically processing 40 SAE lubricating oil, so that it enters the combustion chamber, through the carburetor, as an oil fog, and coats all upper cylinder parts with a film of clean oil. The results of this better lubrication are more power, more mileage per gallon, more pep, less wear and repair, freedom from carbon and gum and prevention of overheating and oil pumping. Now when it is so important to keep equipment in operation and out of the repair shop, LUBRI-GAS is in deed a God-send!



Send for Free Lubri-Gas File. Contains complete information about this modern motor fuel treatment.

LUBRI-GAS ,221 No. LaSalle St. Chicago 1, III.



thru

Carburetor

Cleans and Lubricates as It Powers the Motor



Spotting and short hauling of various loads of raw materials and finished products on pallets up to 4000 lbs. and on skid platforms up to 6000 lbs.



- Positive Mechanical Brake with Emergency Control
- Controls in Steering Handle
- Forward and Reverse Speeds
- Front Wheel Power-Drive
- Shockless Hydraulic Platform Lift with Easy Foot Control



SEND FOR BULLETINS FEATURING THE TRANSPORTER AT WORK Why STRAIN? Why PULL? Why TUG? Why PUSH?

when the battery-operated TRANSPORTER moves more tons per load and one operator does the job without back-breaking effort.

The streamlined and sturdily-built TRANSPORTER maneuvers with ease in narrow aisles and congested areas. Loads totalling tons are moved quickly and safely and workers do a bigger and better job without tiring.

Users of the TRANSPORTER are saving thousands of dollars and bulletins we will gladly send you give you interesting details on these savings.

MANUFACTURERS FOR OVER 38 YEARS Electric Propelled INDUSTRIAL TRUCKS



AUTOMATIC TRANSPORTATION

57 WEST 87th STREET

CHICAGO 20, ILL.

Division of the Yale & Towne Manufacturing Company

Start. being

ndle indle vide

15

ed by inced draw iption

s and e de-

weldhem-

The nonering

phy-cast meinum [etal;

otors

n its

titled

raw-

y demost

ount-

ading, the

effect reep.

bear-

ssued

bus

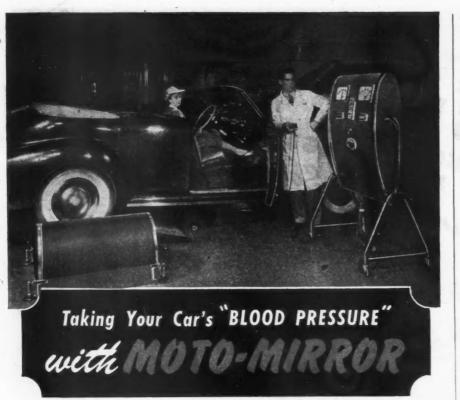
older, y de-r. It e of

alogs and de-

con-

gine dia-

RIES



Before long, your progressive car dealer or service shop will measure the mechanical condition of your car as accurately as a doctor reads your blood pressure.

Just as there are established standards for human blood pressure, there is a standard performance for the car you drive. It is computed in terms of horsepower delivered at the rear wheels.

With MOTO-MIRROR, in five to eight minutes, every unit of your car will be tested under actual driving conditions, without leaving the service shop. You and your service mechanic can see exactly what adjustments or repairs are needed. Your car will then be tuned to its peak performance—to meet your individual driving and climatic conditions—not to compromise factory settings that must be based on average conditions. You will clearly see the improvement in horse-power and enjoy improved performance on the road.

This practical means of measuring automotive performance has been developed over a period of years, from the bulky, expensive laboratory dynamometer. Extensively used in the service field for the first time by the Armed Forces, it has proven invaluable in assuring peak performance at all times and for preventive maintenance. MOTO-MIRROR has all the accuracy of laboratory equipment, but is simple, compact, easy to operate and priced within the reach of any car dealer or service shop.

IF IT'S OK ON MOTO-MIRROR IT'S OK ON THE ROAD



grams covering design, operation and construction are included and separate price sheets on complete units, as well as parts and accessories, are provided to fit into each catalog between specification pages.*

catalog between specification pages.*

A 20-page illustrated bulletin, entitled
Everywhere in Industry, describing Hycar
Chemical Company's special purpose synthetic rubbers and their industrial usage,
has been released by the company. The
first half of the booklet is devoted to a
pictorial resume with a discussion of the
process by which these special purpose
synthetic rubbers are manufactured. The
latter part covers the properties and applications of vulcanized compounds of the
three types of Hycar now available.*

South Bend Lathe Works Catalog 9-G

South Bend Lathe Works Catalog 9-Gillustrates in color and describes its line of 9-inch engine lathes and toolroom lathes. Also shown are 9-inch precision turret lather which have ½ inch collet capacity. Lathe tools, accessories, motors and controls, and attachments for special classes of work are illustrated and described in detail.*

A new 4-page bulletin, No. SC-124, issued by Surface Combustion Corp., describes the dry cyaniding process as carried out in continuous furnaces developed for the purpose. Details covering the action of process, photomicrographs comparing the results of bath and dry cyaniding, suitable temperatures, applicable types of steels, the atmosphere constituents, etc., are presented in addition to illustrations of the furnaces.*

*Obtainable by subscribers within the United State through Editorial Dept., AUTOMOTIVE and AVIATION INDUSTRIBES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

Allison Building Jet Engines for the Navy

Allison Division of General Motors Corp. is building jet propulsion engines for the U. S. Navy in addition to jet engines now in production for the Army Air Forces' P-80 Lockheed Shooting Star.

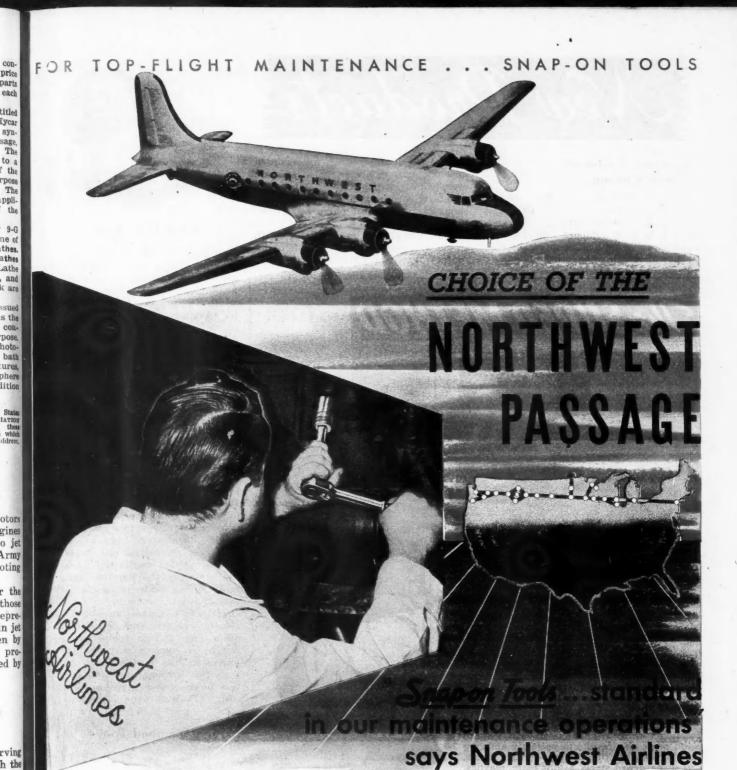
The jet engines being built for the Navy are of a different type than those in production for the Army, thus representing a two-fold production job in jet engines that have been undertaken by Allison. Both engines are being produced to the basic design developed by the General Electric Co.

Thompson Field Group Meets in Detroit

J. Walter Thompson Co. men serving Ford branches and dealers through the agency's 10 U. S. offices, met in Detroit June 25 through 28 to discuss plans for providing localized advertising assistance to the in with the Ford Motor Company national advertising program. These men also serve the Dealer Advertising Fund Accounts handled by the Thompson agency.

Baldwin Will Open Headquarters in Paris

The Baldwin Locomotive Works will open headquarters in Paris in September to provide coverage for Baldwin's heavy machinery in France and its colonies and in Belgium, and Holland, Thomas Butts, of Whitehall, Pa., has been named to direct the new office.



TOP FLIGHT across America . . . a swift, direct route between Atlantic and Pacific . . . with its extension of service to Detroit and New York, Northwest completes the nation's fourth great coast-to-coast airline!

In the maintenance operations of Northwest Airlines, Snap-on tools have long played an important part. "As America's second oldest air transport company Northwest was necessarily a pioneer in developing many advanced maintenance practises," says Northwest Airlines . . . "and Snap-on tools have met our most rigid requirements. From the start Snap-ons have so conclusively demonstrated their superior speed, accuracy and adaptability that they have become standard in our maintenance operations."

Snap-on's nation-wide tool service is available through 38 factory branch warehouses. Write for the 1945 Snap-on catalog.

SNAP-ON TOOLS CORPORATION, 8054-G 28th Ave., Kenosha, Wis.



etroit is for

assis-

Iotor

gram.

dver-

s will

ptemwin's

d its

lland, , has e.

TRIES

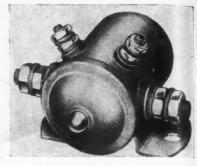
New Products

Completely Enclosed Solenoid Contactor

The R-B-M Type 71 direct current solenoid contactor, now being produced by R-B-M Manufacturing Co., Logansport, Ind., is a compact unit for low voltage power application on either stationary or mobile apparatus.

Magnet coil and contacts are enclosed in a magnetic iron case, with cap spun over, to provide protection against dirt, moisture, vermin, and other destructive elements. All metal parts are plated for further protection.

This contractor is available with single pole, normally open, double break contacts, rated at 100 amp continuous;



R-B-M Type 71 contactor

300 amp in-rush at 32 volts direct current and below. Copper contacts are standard, though special alloys are available. Approximate size of unit width 31/4 in., depth 3 in., height 21/4 in. Average weight, 14 oz.

Fatigue Testing Machine For Dynamic Tests

The Avery "Pulsator" fatigue testing machine for carrying out dynamic tests on both materials and finished parts was developed by W. & T. Avery, Limited, Soho Foundry, Birmingham England. It allows for applying pulsating or reversed axial push-pulsating or reversed static push or pull load to either specimens of material or to full-size machine details. By the use of special tools, the latter can also be subjected to a reversed bend test.

The "Pulsator" is a dual-mas resonance machine, one mass bein formed by its oscillating system and the other by the machine base. The cross spring beam is oscillated by a exciter unit consisting of a flexible shaft which drives an out-of-balance rotor at one free end of the beam. The other free end is compensated by weight in such a way that the the halves of the spring beam have a actly the same natural frequency. The test piece, whose grips are connected.

(Turn to page 64, please)

Largest Diamond Tool



This diamond dresser, said to be the largest in the world, was made by the Diamond Tool Co., Chicago, Ill. The diamond originally weighed 62.5 carats, and after 4½ years constant service it still is in use. It has been re-set seven times and now weighs 19.2 carats.



FROM the days of the first wheel on up through the ages, increasingly better and more accurate bearings have made it possible for man to step up his rate of travel from a plodding mile per hour to nearly a thousand times that speed today.

The mechanisms that now hurl a human being through the air at twelve miles a minute often call for bearings that must run at 400 revolutions a second and more!

To provide perfectly sized and perfectly matched balls for such precise bearings and to sort them fast enough to keep pace with the demands of war, the Electronics Department at Jack & Heintz developed the Automatic Ball Gauge.

IT'S DONE WITH ELECTRONICS!

When fed commercial balls—already graded to a tolerance of 1/20,000 inch—this machine sorts them into groups five times more accurate! As many as ten size selections can be made, each group being separated by only ten millionths of an inch, and it's done fast and automatically. The operator needs only to fill the plexiglass hopper and remove the sorted balls. One operator handles four machines easily; these four machines sort more balls and do it far more accurately than 32 skilled operators using conventional measuring equipment.

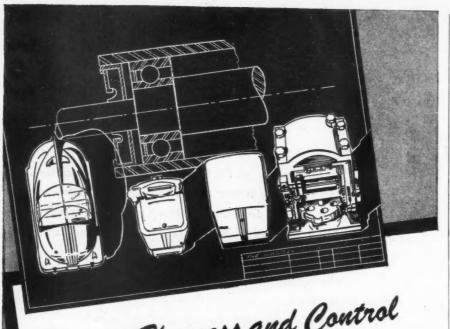
HOW CAN JACK & HEINTZ HELP YOU?

The automatic ball sorter is just one example of how Jack & Heintz engineers have solved a great many such problems. If you are developing new designs or are concerned with post-war production problems, this is the kind of engineering skill and know-how that is available to help you.





TRIE



How to Harness and Control VIBRATION NOISES

Today, vibration control on postwar equipment is a major subject with most of the leading equipment and appliance manufacturers because it adds greatly to the longevity, efficiency and performance of their products. Vibration control also means quiet, smooth operation which in turn is a potent sales point in selling appliances of all kinds.

Harris Torflex Flexible Bearings will prolong life, lower maintenance costs, insure more dependable and accurate operation and increase efficiency. This is done by absorbing shock, controlling vibration, silencing noises, providing flexishock, controlling vibration. Harris Torflex Bearings consist eliminating wear and friction. Harris Torflex Bearings consist of a seamless tube of rubber which has been stretched between two concentric metal tubes, assuring high radial between two concentric metal tubes, assuring high radial between two concentric metal tubes, assuring high radial and metal. Torflex Bearings take axial, torsional, and radial and metal. Torflex Bearings take axial, torsional, and radial loads and come in a wide range of sizes, carrying loads from ounces to tons. They are widely used and universally approved,

Harris pioneered in the field of engineered vibration control, consequently Torflex Flexible Bearings and Harris Mounts are widely used on prewar equipment, Army and Navy planes, military mobile units of all kinds, industrial equipment, automobiles, electrical and electronic products. If you have a vibration problem, our engineers would welcome an opportunity of working with your engineers, just drop us a line.

EARES PRODUCTS CO.
CLEVELAND 4, OHIO
U. S. A.

to the oscillating beam, is thus subjected to axial push-pull stresses, and the oscillations are transmitted to the loop dynamometer through the test piece. The number of stress cycles varies between 2,600 and 2,900 per minute. Increase of motor speed brings about an increase of the amplitude of the cross beam and thereby an increase of stress. The test speed is thus principally dependent upon the frequency of the beam, the elasticity of the test piece having no influence.

terna

poten

may l

type

moun

The

vided

cision

ively

conne

wide

uirer

Pro

sed 1

ionin

ettin

ortio

orima

empe

aces

nap-The

cal., l

eratu hanic re de ange losed

hrow.

epend

w th

o any

act o

s des

n bal

etric

not

arke

Cam

ully a

II-Pı

Com

have Arro com mou hing

has i mod 2 in pin,

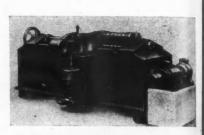
it is

Safe

lly 1.

eat

The process of applying the load can be observed during operation through a microscope connected to the dynamometer. Two cut-out switches stop the machine and the counter when the specimen breaks or when the amplitude becomes excessive. The machine works on the rising portion of the resonance



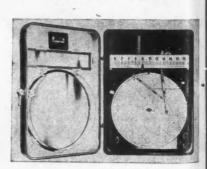
Avery Pulsator

curve, avoiding the peak of resonance Being of the resonance type, it requires but a small driving motor. This motor runs on direct current in order to obtain speed variations within wide limits, and an a-c/d-c motor generator unit fitted with an automatic voltage control device insures a constant current supply. There is ample space be tween the gripping plates to accommodate full size components and, if required, special equipment for low or high temperature tests, corrosion tests and other similar accessories.

Electric-Type Potentiometer Controller Series

The Bristol Company, Waterbury, Conn., announces a new series of electric-type potentiometer controllers. Five basic control unit types are available. Three are electric contact type to be known as the Microact controllers and the other two are electric proportioning and current input types. The control units are mounted on the in-

(Turn to page 67, please)



Bristol potentiometer controller

ternal panel of the Bristol Pyromaster potentiometer recorder and any type may be readily converted to any other type by following simple wiring and mounting instructions.

suh.

cles

nin

ings

ance This order

wide

rator

tage cur-

e be-

nmo-

f re

tests

oury

elec-

llers.

ypes

opor-

The

TRIES

e

The three Microact units are provided with one, two, and three precision-type toggle switches respectively and six different terminal board connection arrangements to meet a wide assortment of control circuit requirements.

Proportioning controllers may be used with any type of electric proportioning valve and may be had with resetting contacts if required. The proportional current input controller is primarily designed to provide close emperature control of electric furnaces and ovens.

Snap-Action Control Devices

The Paul Henry Co., Los Angeles, Cal., has brought out a complete line of control devices embodying a snap ction arrangement which lends itself o unusually accurate control of temperature, pressure, humidity and mehanical displacement. Other features re double break contacts; applicable ange from —100 F. to 600 F.; enlosed contacts; single pole single hrow, single pole double throw or intependent circuit double throw; and by thermal lag. They are adaptable of any mounting means, and have conact openings from .010 in. to .060 in. In the desired. Operating parts are always a balance thermally as well as geometrically, and accuracy of calibrations not affected by under heat or over eat conditions. These devices are marketed under the name Cam-Stat.

Cam-Stat temperature controls are ully adjustable over a wide range and

ll-Purpose Mirror



Complications in mirror mounting have been eliminated by this new Arrow product. Designed with a combination bracket it can be mounted either on the body or door hinge. The door hinge attachment has been made adjustable to accommodate hinges varying in size from 2 in. to 3 in. Complete with hingepin, set-screws, and telescopic shaft, it is ready for use on practically any type vehicle. Made by Arrow Safety Device Co., Mount Holly, N. J.

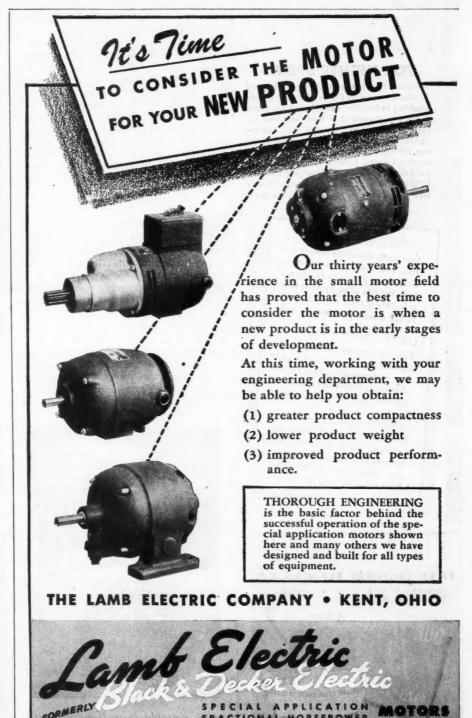
are furnished with operating differentials running down to as low as 1 F.

Mild Steel Electrode For Cast Iron

"Harcast," an all-position mild steel electrode for welding and repairing cast iron, is the latest development of the Harnischfeger Corporation, Milwaukee, Wis. Entirely new, P&H "Harcast" fuses well with either mild or medium carbon steel, thus making it suited for joining cast iron with steel. With a yield point of 50,000 psi, the deposited metal has an ultimate tensile strength of 60,000 lb, roughly (Turn to page 68, please)



Cam-Stat thermostat



LUBRIPLATE Nos. 1-2-3-4



FOR HIGHER SPEEDS

Probably the severest tests for high speed lubricants occur in the textile and woodworking industries. These industries have definitely proven that machines can be run safely at higher speeds with LUBRI-PLATE lubricants. With these revolutionary lubricants, there is far less replacement of parts. Burned-out bearings are held down to an unprecedented minimum. LUBRIPLATE lubricants in various densities are available for all applications.

LUBRIPLATE

Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRI-PLATE arrests progressive wear.

LUBRIPLATE

Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

Lubricants are extremely economical for reason that they possess very long life and "stayput" properties. A little LUBRI-PLATE goes a long way.

Write for a booklet, "The LUBRIPLATE Film", written especially for your industry.



double that of a good grade of cast iron.

Usable with either a-c or d-c machines (straight or reverse polarity on direct current), "Harcast" is said to work well at low amperage, thus minimizing the dilution effect at the fusion zone and permitting a higher quality of machining.

Transparent Compar Gloves

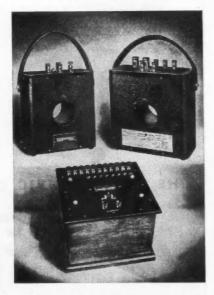
To protect hands from irritating solvents, Resistoflex Corporation, Belleville, N. J., is making a transparent glove from compar, the vinyl resin derivative used by them for all manner of protective garments.

These gloves give complete protection because skin surfaces are prevented from coming in contact with fuels, oils, paints, lacquers, thinners, dry cleaning fluids, degreasing solvents, sulphur-base cutting oils, etc. Impervious to all organic fluids and many that are inorganic, the gloves are highly abrasion-and-tear resistant. In a wide variety of plants where varsol is used for degreasing metal parts or where kerosene is employed in the Magnaflux inspection process, compar gloves are said to be the recognized solution to the problem of protecting the skin.

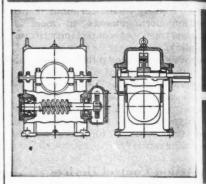
Portable Transformers

A new line of portable current transformers, Types JP-2, -3, and -4, is now in production at the General Electric Company. All three types may be obtained as multirange units. Type JP-2 is also available as a single-range unit.

The JP-2 and -3 units meet the accuracy requirements of the ASA 0.3 accuracy class with burdens B-0.1, -0.2, and -0.5 at 60 cycles. Both units, of the through-window-type construction, are suitable for laboratory-standard (Turn to page 70, please)



G-E portable instrument current transformers



FOR HEAVY GOING

LUBRIPLATE No. 8 possesses an extremely high film strength and is just the correct density for the general run of enclosed gears (speed reducers). It is especially suitable for worm gears and other types carrying heavy loads. Typical of all LUBRIPLATE lubricants, No. 8 has exceptionally long life.

> FOR YOUR MACHINERY

No. 3—Ideal for general oil type lubrica-tion. Ring oiled bearings, wick feeds, sight feeds and bottle oilers.

No. 8—Because of its high film strength end long life reflects outstanding per-formance in most types of enclosed goars (speed reducers).

HE

xac

ngi

nore

tan

ou

T

leve

et-1 hat hic

M

ETT

uly

No. 107—One of the most popular grease type products for general application by pressure gun or cups.

No. 70—For a wide range of greese applications, especially at temperatures above 200 degrees F.

No. 130-AA—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING—This is the LUBRI-PLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

Write for a booklet, "The LUBRIPLATE Film", written especially for your industry.





Inside an engine, it's Pedrick know-how that counts

THE KNACK OF MAKING RINGS that meet the xacting performance-requirements inside an angine... and meet them in a way that assures nore power with fewer overhauls... is an outtanding Pedrick accomplishment that will save you time and money.

Through years of experience and outstanding levelopment-work, Pedrick has been able to et-up exclusive methods of manufacturing rings hat allow virtually no variation whatever in hickness, width, tension, or other vital perform-

ance-characteristics. There is no tendency to warp or distort in service, or to gain or lose in tension.

To engineers interested in rings that will deliver longer-lasting operating efficiency, you'll find Pedrick performance outstanding both for original equipment and for replacement service.

WILKENING MANUFACTURING Co., Philadelphia 42, Pa. *In Canada*: Wilkening Manufacturing Co. (Canada), Ltd., Toronto.

MORE BONDS TODAY
MEAN
SETTER LIVING TOMORROW

Redrick precisioneered PISTON RINGS

STRIE

work or for testing work in the field.

The JP-3 unit is designed with a combination of wound-primary and through-primary construction. Ratings of 100 amperes and below are obtained by a wound-primary with the terminals on the top of the transformer. By passing a conductor through the transformer window once, 1000- and 1200-amp ratings may be obtained. Additional ratings may be gained in both units by passing the conductor through the window two or more times.

The Type JP-4 transformer is designed for highest-grade application as a laboratory standard. It is of wound-primary construction with taps in the primary coil for the different ratios.

Deep-Throat Speed Clamps

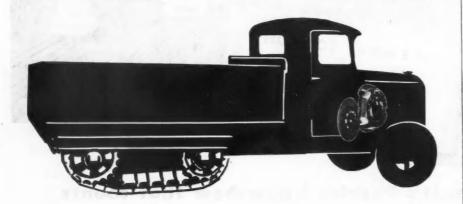
A line of deep-throat clamps is offered by Grand Specialties Co., Chicago, Ill. The new type "C" clamp is known as the Grand ASL extra deep throat speed clamp. It is claimed that the clamp can be positioned instantly by simply pushing down on the ratchet screw, and tightening with a turn of the loose-proof handle. The clamp is said to release instantly by loosening the handle and pushing with thumb or finger on trigger release pawl which frees the ratchet screw so that the clamp is ready immediately for application to work of any other size or thickness.



Grand ASL speed clamp

This new Grand clamp is claim to hold work with a firm tension gon any surface, even slanting or irrelar, and is equipped with replace ball and socket swivel to prevent shing or creeping. The trigger relapavel is described as having harde teeth which hold a meshed grip un spring tension on the ratchet so while clamp is set.

CLUTCH Knowhow That Will Simplify Your Redesigning



If the products you are redesigning for the post-war market will benefit from better conforming CLUTCHES, our engineers can give you timely help. You can utilize their extensive, war-tested clutch designing, building and applying knowhow to simplify your redesigning and to strengthen the competitive position of your new products.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS.

Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will

ROCKFORD CLUTCH [FORMERLY KNOWN AS] DIVISION BORG-WARNER

ROCKFORD CLUTCH [PORMERLY KNOWN AS] DIVISION BORG-WARNER CORPORATION
315 Catherine Street, Rockford, Illinois, U.S.A.



Acid Cleaning and Descaling Compound

Pennsalt PM-90, a specially preparacid cleaning and descaling compounds recently been introduced by Pennsylvania Salt Manufacturing (Philadelphia, Pa.

Pennsalt PM-90 contains additionagents for surface action and inhibition. It is primarily used as a picklibath concentrate in electroplating shand as an acid cleaner for removing the surface of the sur

Portable Hardness Tester

An instrument that is said to mi practical the taking of a hardness tright where the material is, instead taking a specimen to a testing machine



Type P hardness testing hamme

has been brought out by Steel 0 Testing Laboratory, Detroit, Mich. is identified as a portable hards testing hammer type "P."

If material of a certain degree hardness is to be selected, it is onecessary to see whether the diameter of the impression made by the hardness testing hammer corresponds to desired degree of hardness. If the

(Turn to page 74, please)

Precision-Processed ALUMINUM WIRE, ROD, BAR

insure higher quality forged or machined products

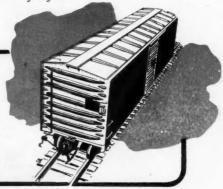
WHETHER YOU'RE BUYING STOCK for forging or machining ... R317 or any of the other aluminum alloys ... Reynolds can save you production time and money, help insure better finishes.

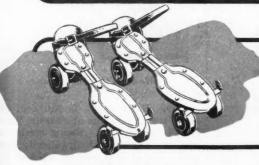
The moment you receive your materials, they're ready to go... heat-treated rod and bar for automatic screw machines... stock for forging...

all of it carefully inspected, fully identified.

What's more, because of Reynolds complete quality control, tolerances are extremely close. No time is lost in re-setting machines; no material wasted in unnecessary rejects.

WEIGHT SAVER! Today's first and *only* especially designed aluminum box cars are lighter and stronger... built to take constant punishment. Thousands of nuts, bolts and rivets made from Reynolds precision-processed aluminum alloy rod and bar are used together with quantities of R301 sheet.





STRONGER...LIGHTER, TOO! Maybe the roller skates your kid uses after Victory won't look much different from what he's using now but they and other articles will be stronger, lighter, more durable, because of parts machined or formed from Reynolds Aluminum.

Consider Aluminum... Consider carefully the added efficiency and economy offered by the new Reynolds aluminum alloys. Consider... ease of fabrication... thermal and electrical conductivity... lightweight... corrosion resistance... strength... reflectivity... non-magnetic, non-sparking and non-toxic qualities... pleasing appearance... new low costs. And finally, consider Reynolds nation-wide production and service facilities. Reynolds Metals Co., Aluminum Div., 2513 S. Third St., Louisville, Ky... Consider Aluminum... Consult Reynolds.



See catalog in Sweet's...or write for catalog No. 100-A (above); also ask for Special Bulletin 31-A on Wire, Rod, Bar.



REYNOLDS

The Great New ALUMINUM

INGOT . SHIET . SHAPES . WIRE . POD . BAR . TUSING . PARTS . PORGINGS . CASTINGS . FOIL . POWDER

sion gor irreg

ent sh r rele harde rip un

et so

ompou

by

additi

pickli

ng shi removi

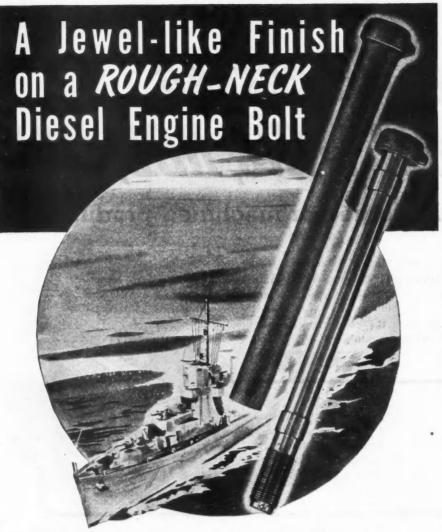
d ind

ness t

Mich.
hardnegree
is of

he hads to

DUST



Whatever YOUR unusual precision parts job, Western offers you the ingenuity and skill to do it...on a quantity production basis

There can't be any fooling around when it comes to parts like these connecting rod bolts that go into Cooper-Bessemer 600 and 850 h.p. diesels that furnish propulsion and auxiliary power to Uncle Sam's naval units. Over 15" long, with $1\frac{1}{2}$ " body diameter, these husky bolts are turned and ground from rough forgings of heat-treated alloy steel. Five separate grinding operations give them a jewel-like finish, free of tool marks. Specifications include class 3 ground threads and piece-bypiece Magnaflux inspection to make sure there are no hidden defects. Western produces them, fast and flawless — a good tip on where to get your unusual precision parts jobs done. It pays you to send us your inquiry.

Western Complete Service — Special precision screw machine products to specifications. Capacity range, $\frac{1}{6}$ " to $4\frac{5}{8}$ " round. Complete equipment for all types of secondary and processing operations — precision grinding, heat-treating, hardening, pentrating.



pression is smaller or larger, the specimen is either too hard or too soft, which can be checked with microscope and chart supplied.

Complete Range of Safety Spectacles

Safety spectacles in a complete range of sizes to fit every face are now being made by Willson Products, Inc. Reading, Pa. With a choice of 2 frame sizes, any face type can be well fitted. Comfort features are the plastic rocker nose pads which are self-adjusting to the size of the bridge, and adjustable cable temples.

The spectacles are available in clear or Willsonite green glass with or with out a variety of 10 types of side shield in clear or green plastic, wire mesh, or leather. Clear flat lenses, 1.25 curve or 6 curve, or flat Willsonite in four shades, may be obtained.

General-Purpose Crane

The Model YC-5 Cargocrane has been added to the line of general-purpose Cargocranes made by Link-Bell Speeder Corp., Chicago, Ill. It has a lifting capacity of 2900 lb at 15 fradius — up to 15,000 lb at 3½ fradius — up to



Model YC-5 cargocrane

radius. Boom swing is 210 deg, with short turning radius of chassis. Wheelbase is 10 ft, 9 in. Swing mechanism and steering are hydraulically operated. Steering is accomplished by dua wheels operating on a pivoted axis. The entire unit is operated by a 57-by engine, through a three-speed transmission, for traveling, swinging, hoisting and boom hoist.

Boom is of a goose-neck type, 20 fl long, and can be furnished either in one piece or telescopic.

Cold Setting Plastic

The Irvington Varnish & Insulator Co., Irvington, N. J., has introduced a cold setting plastic to be used as a filling material for junction boxes stuffing boxes, pot-heads and similar void spaces encountered in electrical work. Known as Cardolite 5616, this liquid resin is mixed with Irvington 5612 setting agent prior to use. Approximately four hours after mixing the two ingredients will gel at room temperature to the point where flow is

(Turn to page 76, please)

2.5 HORSEPOWER PER POUND

IS THE OUTPUT OF THIS

VICKERS AIRCRAFT HYDRAULIC MOTOR

mplete e now , Inc., of 20 wellplas-

clear

with hields sh, or curve

l-purk-Belt has a

with Vheel-

anism oper

y dual

axle 57-h

trans

hoist

20 f

ulator

ced a

23 1

boxes milar trical

, this

ixing

room low is

TRIES

ner

PISTON TYPE CONSTANT DISPLACEMENT

This Vickers Aircraft Hydraulic Motor weighs only 6.4 pounds yet it has a normal output rating of 16 horsepower at 3000 psi and 3750 rpm.

But a high horsepower/weight ratio is not the only advantage of using Vickers Hydraulic Motors for delivering rotary mechanical motion on many aircraft applications. These hydraulic motors save space as well as weight. Starting and stalled torque can be higher than operating torque if desired. They can be stopped accurately to position . . . no clutches or brakes are required. They are used for dynamic braking and can be stalled for long periods without damage. These hydraulic motors can be started and stopped at high acceleration and deceleration rates due to the very low inertia

of the moving parts. They cause no radio interference. Reversal and accurate control of speed are very simply and easily accomplished.

Whether designed primarily for aircraft work or for flexible power transmission and control in industrial installations, Vickers Piston Type Hydraulic Motors are inherently simple and rugged, with resulting minimum maintenance; they are easy to install and widely adaptable. All of these characteristics suggest many applications to a wide variety of new postwar equipment.

VICKERS Incorporated . 1428 OAKMAN BLVD. . DETROIT 32, MICHIGAN

Engineers and Builders of Oil Hydraulic Equipment Since 1921

no longer possible, and after several days, the end product is a tough rubbery mass which will not flow under heat nor become brittle in the cold. The set compound is insoluble in water, oil, acids and alkalies. Although Cardolite 5616 will adhere to metal, it can be stripped away cleanly to allow repairs to terminals and cable strips.

Plastic Upholstery

An extensive new line of plastic upholstery for civilian use that is both waterproof and flameproof was revealed by United States Rubber Co. The plastic upholstery, known as Nauga-hyde, will be made in a wide range of

light and bright decorative colors and even two-tone effects as well as in a variety of grains.

Because this new type material is waterproof and unharmed by exposure, it can be used successfully in open cars, boats and for other outdoor installations, company officials stated. It will not be affected by perspiration, salt water, alcohol, gasoline, oils, greases, most acids and alkalis, and can be cleaned with soap and water.

Autoflight Bellows

G. M. Giannini & Co., Inc., Pasadena, Cal., has entered the field to manufacture fabricated metallic bellows. Engineered to customer specifications, Autoflight bellows are made from stain. less steel, phosphor bronze, beryllium copper, brass, or special alloys. These units range from custom-made closely held bellows to mass produced low cost bellows of standard types and charac-

Easy-Loading Trailer

Palmer-Shile Co., Detroit, Mich., has placed on the market a trailer in which an underslung design drops the platform down to within 61/4 in. from the floor, providing a low center of gravity for loading from floor, skid or rack, The platform, which is 38 in. wide by 78 in. long, rolls on rubber-tired, ball-



Palmer-Shile trailer

bearing metal wheels. The trailer has an all-welded structural steel framework, and will handle loads up to 21/2

All-Position Cast Iron Welding Rod

Alloy Rods Co., York, Pa., is introducing a new machinable cast iron welding rod called Nickel-Arc. The maker states that Nickel-Arc may be used with alternating or direct current in all positions. No preheat is required to obtain porosity-free deposits, completely machinable in the weld deposit fusion zone. The weld deposit closely matches the color of the parent cast iron.

Universal Tool Holder

A universal tool holder, in three popular sizes, is now being delivered by Symmetric Manufacturing Co., Burbank, Cal.

The holder accommodates any size and length (within its capacity) of ground or carbide tipped tool bits, as well as parting, threading, facing, forming and boring tools, and dial indicators. It can be quickly adjusted to any position, both external and internal, without removal from the tool post. Any angle can be achieved by loosening the head bolt, with a standard lathe wrench, and turning the tool to the desired position.



Symmetric tool holder

WINNING THE PEACE



The Standard Clutch in Peace or War!
New Engineering Manual now Available on Request



BORG & BECK DIVISION

BORG-WARNER CORPORATION

HEAT TRANSFER

... and some often-overlooked factors that retard it

Frequently, in choosing a material for heat transfer work, too much importance is given to its thermal conductivity.

ions,

tain.

lium

'hese

sely

COST

rac

has hich

plat-

the

rav.

ack

e by

ball-

has

ame-

21/2

ntro-

iron

The

y be

rent re-

sits,

deposit

rent

hree

rered

Bur-

size

) of

s, as

cing,

l in-

ed to

in-

tool

d by

dard

ol to

RIES

This is done in the belief that the conductance of the material is the main factor in determining the heat transfer efficiency of the equipment throughout its working life.

The importance of other properties which may contribute more, in the long run, to successful heat transfer is disregarded. The importance of oxidation

resistance . . . and freedom from corrosion products . . . for example, are often overlooked.

In actual service under corrosive conditions and high temperatures, the clean surface provided by rustless, corrosion-resistant materials such as the INCO Nickel Alloys is often more important than the thermal conductivity rating.

CORROSION AND HEAT TRANSFER

Materials that corrode build up jackets of scale.

Such coatings permit relatively little heat to pass through.

The same heat-deadening effect is produced by films that form on metallic walls heated to oxidizing temperatures, and by films of heating or cooling gases that cling to metallic walls roughened by oxidation. Both the corrosive scale deposits and the gas films act as insulators rather than conductors.

This is shown graphically in the accompanying sketch. Note how the films and corrosion scale slow up the heat transfer rate. They make relatively

COMPARISON OF THE CONDUCTANCE RANGES FOR METALLIC WALLS AND FILMS unimportant the thermal conductivity rating of the metallic wall.

Similar evidence is given by the table which shows a comparison of the conductance ranges for metallic walls and films.

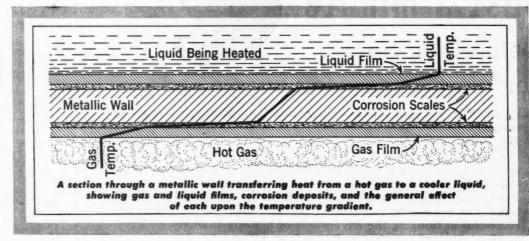
TABLE OF COMPARATIVE HEAT TRANSFER VALUES

Although the absolute values of film conductances vary with conditions and very thin and tenacious oxides within their limiting temperature range. There are no thick corrosion scale deposits to slow up heat transfer...little in the way of roughened surfaces to offer a foothold to gas or liquid films.

In addition, the INCO Nickel Alloys have the other properties needed by aviation construction materials. They are strong and tough...they retain strength and toughness at both high and low temperatures. And the individual alloys have specialized properties that fit them for specialized applications.

USE OF INCONEL IN HEAT TRANSFER

As an example, consider the Inconel boilers that supply steam heat to United Airlines' "Mainliner" cabins.



can be determined accurately only by experiment in each application, their relative values are of the magnitude shown in the accompanying table. Conductance ranges for metallic walls one inch and 0.025 inch thick also are given for comparison.

A study of the sketch and the table confirms the statement that, in many heat transfer jobs, the oxidizing characteristics of a material are fully as important as its thermal conductivity and its high-temperature mechanical properties.

CORROSION RESISTANCE OF INCO NICKEL ALLOYS

Nickel and high-nickel alloys offer a wide range of thermal conductivity. Monel, Nickel and Inconel develop Installed in the engine exhaust stacks, they are exposed to the blast of corrosive gases at 1500° F. They must also resist the shock of inrushing water at 200° F....a difference of 1300° F. on the inner and outer surfaces of the thin Inconel wall. Yet, despite these destructive factors, and the incessant vibration, Inconel boilers give hundreds of hours of completely satisfactory heat transfer service.

For further information about Heat Transfer, important to designers and builders of aircraft, write today for the INCO technical bulletin, "Heat Transfer Through Metallic Walls." Address:

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL ST., NEW YORK 5, N.Y.



Nature of Obstruction



Ask yourself if the blueprints and specifications cover everything. For instance, do they cover . . .

- 1. Engineering Co-operation: Production planning that looks behind blueprints and examines function. Corbin engineers have often suggested changes and combinations that have improved performance and lowered costs.
- 2. Primary Operations: For instance could the part start in the cold headers or must it be milled from the bar? Corbin has been highly successful in bringing the advantages of heading to many a "screw machine product" without upsetting cost factors.
- 3. Secondary Operation: You may require such additional refinements as detail finish, plating, special inspection and "kid glove" packing. Corbin can work to precision tolerances in tenths — grind to microinch specifications — and hob, grind or roll threads to Class 4 tolerances.

You may save yourself a lot of time — and money — by working with Corbin from the start.



Facilities are explained in this bulletin — which you will find in Sweet's File 4m10 for Product Designers. If you prefer that we send you a copy, please request it on your letterhead.

THE CORBIN SCREW CORPORATION

The American Hardware Corporation, Successor



Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTO-MOTIVE AND AVIATION INDUSTRIES

Slightly reduced levels of general business activity are currently in-dicated. The New York Times index for the week ended June 23 declined to 140.2 from 141.6 in the preceding

week, as against 143.6 a year ago.

Department store sales as reported
by the Federal Reserve Board for the week ended June 23 resumed a downward trend, the index for the period standing at 183 per cent of the 1935-39 average, as compared with 206 in the week before and 151 a year ago. Comparisons with last year's cor-responding figures, however, show gains of 15 per cent for the four

gains of 15 per cent for the four weeks ended on that date and 12 per cent for 1945 thus far.

Electric power production in the week ended June 23 registered less than the usual seasonal expansion and was 0.8 per cent above the comparable level last year, as against a similar rise of 1.4 per cent recorded a week earlier. a week earlier.

Railway freight loadings during the same period totaled 876,442 cars, 0.4 per cent more than for the week before but 0.4 per cent less than the corresponding number a year ago.

Crude oil production during the week ended June 23 averaged 4,897,864 barrels daily, a new peak that is 9500 barrels above the figure for the preceding week and 38,264 barrels more than the average output in June recommended by the Petroleum Administration for War.

Production of soft coal in the week ended June 16 is estimated at 11,850,000 net tons, as against 12,070,000 a week earlier and 12,173,000 tons a year ago. The output thus far in 1945 is 7.5 per cent below the cor-

responding quantity last year.
Engineering construction contracts awarded during the week ended June 28, according to Engineering News-Record, totaled \$46,540,000, exceeding by 11 per cent the figure for the pre-ceding week. While this figure is 35 per cent greater than the comparable sum a year ago, for 1945 to date the contract total is 2 per cent below the corresponding amount in 1944.

The Journal of Commerce weekly index of wholesale commodity prices as of June 30, registering a decline

as or June 30, registering a decline of one fractional point, stands at 111.8 per cent of the 1927-29 average, as against 107.8 a year ago.

Member bank reserves decreased \$594,000,000 during the week ended June 27, reflecting a decline of \$76,000,000 in total Reserve Bank credit, an increase of \$340,000,000 in Treaan increase of \$340,000,000 in Treasury deposits with the Reserve banks and other changes. Excess reserves decreased to an estimated total of \$1,300,000,000. During the preceding week, earning assets of reporting member banks rose \$4,109,000,000, including an increase of \$40,000,000 in commercial, industrial and agricultural lange. tural loans.

William Walter

William Walter, 82, founder and past president of Walter Motor Truck Co., died June 23. During recent years Mr. Walter had been a director of the com-



DEATH OF A FALSE NOTION



Preconceived ideas often die hard. When Elias Howe developed his sewing machine its value was not readily recognized because it was considered no novelty; sewing machines had been used for certain rough work long be-

fore 1846. It took a contest with five expert seamstresses to prove that this sewing machine was different—that it could do fine work, accurately and fast, with stitches that were ingeniously locked and would not pull out.

Before the first Clearing Press was built, press operations were limited to relatively small parts of light gauge metals; designers avoided difficult

shapes and deep draws, and could ask for only large dimensional tolerances. But Clearing Presses wrought a marvelous change—they killed old notions as to press limitations. Unprecedented size, speed and accuracy are now proved and commonly attained realities.

Clearing Presses today are doing many a job which "couldn't be done on a press"—saving time and money for manufacturers in many lines. If you are not familiar with the possibilities of truly modern press techniques, we invite you to get in touch with us.

Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING

Centrifugal or Axial Superchargers

(Continued from page 25)

therefore has a negative tangential velocity v_{14} relative to the rotor. Through the action of the rotor blade on the air stream, this negative tangential velocity is reduced to v_{24} , and at the exit from the rotor and entrance to the second stator the air has an absolute velocity v_2 which, as shown in the diagram, is materially larger than the absolute velocity v_1 at the entrance to the rotor. In the second stator the air velocity is again reduced from v_2 to v_1 ,

the same as in the first, and the static pressure of the air is correspondingly increased. The same process is repeated in each stage.

It was shown in Mr. King's paper that with a blade-tip speed of 1500 fps, if the kinetic energy imparted to the air by the impeller were converted into gas-pressure energy without loss, under sea-level conditions, the absolute outlet pressure would be 6.6 times the absolute inlet pressure. However, the larg-

est pressure ratio ever realized under these conditions is of the order of 4 In centrifugal compressors, best efficiencies are obtained with pressure ratios of 1.5-3.

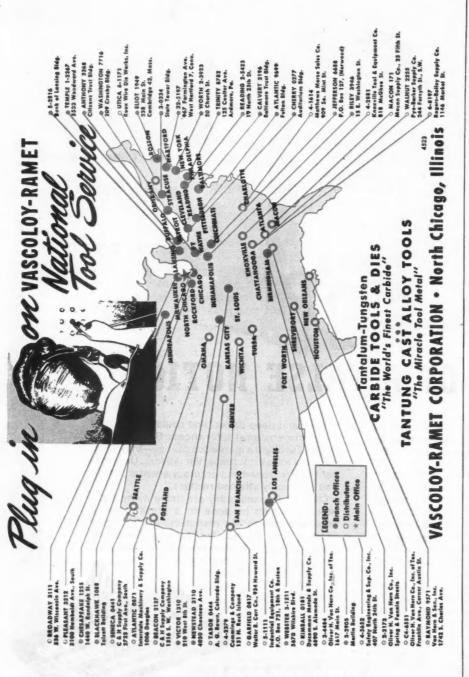
In axial compressors the sure ratio per stage usually is only about 1.15. It is possible to so design the blades of rotors and sta-tors that a much higher pressure ratio will be obtained, but this can be done only at a sacrifice in efficiency, To obtain this result, the rotor blade would have to be given greater curvature, and its small end would have to be nearly parallel with the rotor axis, so as to accelerate the air more rapidly in the tangential direction. This more rapid acceleration, however, would unavoidably result in greater losses, due to what aerodynamicists refer to as "flow separation" and "eddies." Another reason for the much lower pressure ratio per stage in axial compressors is that the tip speed of the blades must be kept lower than in centrifugal compressors, because the tangential velocity of the blades at the inlet is equal to that at the outlet, and therefore much greater than that at the inlet in a centrifugal compressor, unless the speed of rotation is lower.

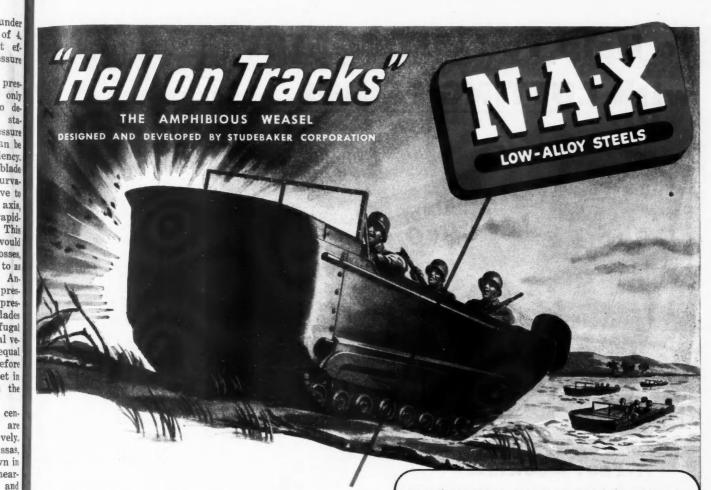
Typical performance charts of centrifugal and axial compressors are shown in Figs. 3 and 4, respectively. Volume flows are plotted as abscissas, pressure ratios as ordinates. Drawn in on the charts in full lines are the nearly vertical constant-speed lines, and dashed, constant-efficiency lines. A characteristic of both types of compressor is that for a given pressure ratio, if the volume flow drops below a certain value, operation of the compressor becomes unstable, giving rise to pulsation or surging. Stability-limit lines for both types of compressor are shown in the charts. In constructing these charts, a practice recommended by the National Advisory Committee for Aeronautics was followed, which makes them applicable under all conditions of inlet temperature. The values plotted are the "equivalent volume flow" and "equivalent tip speed," which are equal, respectively, to the quotients of the actual volume flow and the actual tip speed by the expression $\sqrt{T_1/520}$, where T_1 is the absolute Fahrenheit temperature of the inlet air, and 520 the standard (absolute) atmospheric temperature.

An important characteristic of compressors used for supercharging purposes is the "range" for a certain pressure ratio, which may be defined as the ratio of the maximum to the minimum flow rate at that ratio. From the charts it can be seen that the rate increases as the pressure ratio decreases.

T

With axial compressors peak efficiencies of 80-85 per cent are obtained, as compared with 70-75 per cent with centrifugal compressors. This advantage of the axial type, however, is offset in some measure by the fact that the efficiency peak usually is rather sharp, the efficiency falling off rapidly, par-





PUT N-A-X 9120 ON THE JOB

The track assembly parts of the amphibious Weasel call for something pretty special in steel to meet the requirements.

It must have ductility to permit cold-forming into difficult stampings. And it must have good hardenability and response to heat-treatment to make it strong and tough.

N-A-X 9120 combines these properties in one great steel, and provides in addition excellent weldability for the fabrication of the track shoe. Together, these track parts turnish a good example of the outstanding work being done with versatile N-A-X alloy steels. Consult Great Lakes for assistance in determining the best steel of this series for your particular requirements.

HEAT-TREATED TRACK ASSEMBLY PARTS COLD-FORMED OF N-A-X LOW-ALLOY STEEL



CROSS PLATE



GUIDE



BOTTOM GUIDE WHEEL



TOP GUIDE WHEEL



SHO

GREAT STEELS FROM GREAT LAKES

GREAT LAKES STEEL

Corporation

N-A-X ALLOY DIVISION . DETROIT 18, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

July 15, 1945

A ores-

atio,

tain beation

for

n in

arts, tion-

utics

ap-

inlet

e the

iivare-

> the tip

520.

heit

520 neric

com-

pur-

the num arts

s as

ien-

centage t in ef-

arp,

RIES

When writing to advertisers please mention Automotive and Aviation Industries

81

To Help You CUT COSTS with CUTTING FLUIDS...



Machining costs come down and machining quality improves when cutting fluids are selected and used scientifically. To help you use cutting fluids to better advantage, D. A. Stuart Oil Co. has available four pocket-size booklets full of information gathered from over eighty years experience.

- 1. Cutting Fluids for Better Machining. A comprehensive 60-page hand-book on cutting and grinding fluids. Contains much data on general machining as well as oils.
- 2. Grinding with Oil. Deals with the use of oils for production, precision grinding.
- 3. The 577th Oil. Contains twenty-two case studies showing results of proper oil application.
- 4. Water-Mixed Cutting Fluids. A new booklet which explains the "how" and "why" of so-called "soluble oils" and gives many tips on how to handle them.

These booklets are yours for the asking. Indicate by number which you are interested in. D. A. Stuart Oil Co. Limited. 2733 S. Troy St. Chicago 23, Illinois.

ticularly with a change in speed, also has been observed that when the compressor is operating under condi tions close to those ensuring maximum efficiency, both the centrifugal and the axial type are highly sensitive to conditions of inlet flow, and become up stable on slight provocation. Owing to the higher peak efficiency of the axis type, its effective range in the direction at right angles to the constant-efficience lines, which is limited by instability the one hand and the lowest permissi ble efficiency on the other, is greate than that of the centrifugal type. In: centrifugal compressor the range can be increased by removing the vane from the diffuser, but this generally has the effect of lowering the efficiency a the design operating point, hence th expedient is inapplicable in the case of superchargers for aircraft engines.

In comparing the two types it must be remembered that the centrifugal compressor for supercharging purpose has been under development for more than a quarter century, whereas de velopment of the axial type for the same purpose is only just beginning. As pointed out in one of the papers re ferred to, no photograph of an axia supercharger on an air raft engine has yet appeared in the public prints.

Aside from the factors of efficiency and range, already discussed, the relative space requirements of the two types are of considerable importance. Axia compressors always are much smaller in diameter, and greater in length, than equivalent centrifugal compressors. In order to give an idea of the relative dimensions, Campbell and Talbert worked out complete designs for centrifugal and axial compressors for a volume flow of 5300 cfm, with pressure ratios of 6 and 3. Overall dimensions and other pertinent design data are given in the following table, but it should be pointed out that the diameters and lengths are exclusive of the bearings or bearing supports, inlet ducting, and external wall thicknesses.

Dimensions of Centrifugal and Axial Compressors

Pressure ratioVolume flow, cfm			3.0 5300	
Type of compressor			Centrif.	Axial 6
Efficiency, per cent Equivalent tip speed, fps.	79 1220	7	79 1280	1000
Rpm at 460° abs inlet temp Rotor diameter, in.		26,200	21,300	26,200
O. d., in	25.0	834	25.0	83/4 20
Length, in. Overall space required, ft ³ .	12 3.42	30 1.04	3.5 1.0	0.7

It will be seen from the above that the forms of the two types of compressor are entirely different, and their relative suitability will depend to a considerable degree on the type of engine on which the installation is to be made While the axial type is attractive from the standpoint of efficiency, an increase of its "range" would be desirable, and it will take some time to develop its mechanical design so it can compare favorably with the centrifugal type with respect to lightness on the one hand and ruggedness on the other.



Stocks in Principal Metal-Working Centers

ALT DI CO

Water-Mixed

Cutting Fluids

TRAIGHT LINE TO METAL-WORKING EFFICIENC

Either way-it's the "all around" fastener



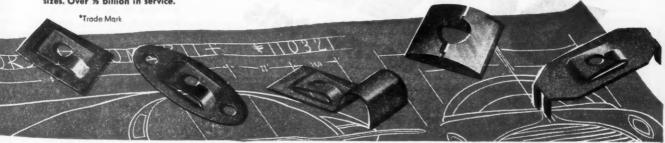
BOTH MEN ARE RIGHT because "all around" has a dual meaning: (1) *STALOCK grip screws with a full 360° contact. (2) *STALOCK is an "all around" many-purpose fastener. This one-piece, resilient, austempered, self-locking sheet metal fastener saves weight and speeds assembly time. Tightens with screw driver; no wrench needed. Eliminates lock washers. Meets and exceeds specifications (AAF 25533) and awarded AAF rating. ADEL provides low-cost precision stampings made to your specifications. Industrial Users—Ask about *STALOCK PUSH-ON fasteners for assemblies using metal or plastic threadless studs, rivets, even nails. For catalog, complete information, write Department N-504.

Saddle, anchor, flat types and wide variety of other types and sizes. Made by ADEL—world's largest manufacturer of aircraft line support clips and blocks. 13000 types and sizes. Over ½ billion in service.



ADEL PRECISION PRODUCTS CORP. Burbank, Calif. • Huntington 17, W. Va. Offices: Seattle, Chicago, Dayton, Detroit, Hagerstown, Boltimore, New York * Canada: Railway & Power Engineering Corp., Ltd.

Copyright 1945, Adel Precision Products Corp



d. I

imum d the cone unng to

axial ection ciency ty on missi

eate

In a

vane

y hai

cy at

e the se of s. must fugal poses more s der the g. As se reaxial

e has

iency

rela-

types

Axial

naller than

s. In we diorked l and ow of 6 other

s are

aring ernal

xial

t the

essor

rela-

conngine

from rease and o its ipare type

RIES

D Axial

Personals

(Continued from page 48)

man, Exec. Vice-Pres., elected a director. Morse Chain Co., Frank M. Hawley, Vice-Pres. and Gen. Mgr. and member of Board of Directors.

Lear, Inc., H. T. Sagert, supervision of postwar market plans for aircraft radio; Calif. Div., George Tharratt, Gen. Mgr.
The General Tire & Rubber Co., Max M.

Gilman, formerly Pres., Packard Motor Car o., to study postwar market potential. ACF-Brill Motors Co., William B. Mc-

Gorum, District Sales Mgr., New York Sales District.

Packard Motor Car Co., R. R. Rees, in charge of company purchases; W. H. McCoy, Gen. Master Mechanic of Aircraft Engine Div. at Detroit.

Menasco Mfg. Co., Harold F. Schwedes, Director of Manufacturing. Penna. Salt Mfg. Co., Frank E. Murphy, Dir. of Development Div., Research and

Dir. of Development Div., Research and Development Dept.
Cutler-Hammer, Inc., F. R. Bacon, Chr. of Board; H. F. Vogt, Chr. of Exec. Committee; G. S. Crane, Pres.; H. F. Vogt, Vice-Pres. and Treas.; J. C. Wilson, Vice-Pres. and Sec.; P. B. Harwood, Vice-Pres. Chg. of Engineering; P. S. Jones, Vice-Pres. in Chg. of Mfg.; E. W. Seegar, Vice-Pres. in Chg. of Development and Asst. Sec.; M. R. Chg. of Development and Asst. Sec.; M. R. Fenno, Asst. Treas. and J. C. Springer, Asst. Sec.

Farrel - Birmingham, Inc., Robert M. Honegger, Gen. Mgr., Gear Plant, Buffalo. Graham-Paige Motors Corp., William B.

Stout, Postwar automobile developme

The International Nickel Co., Inc., E Hergenroether, Chg. of automotive steel velopment, Development & Research 1

with headquarters in Detroit. Penna. Rubber Co., Frederick T. Wind

Asst. Sales Mgr. Consolidated Vultee Aircraft Corp., p Div., George Ford, in charge of division Square D Co., Kollsman Instrument Alan G. Binnie, Asst. Gen. Mgr.; Phili Weber, Factory Mgr. in Chg. of Mfg. Op tions of Div.

Tr

Curtiss-Wright Corp., Jack Ande Public Relations Rep. on West Coast. Wright Aeronautical Corp., Cincl Cincir

William D. Kennedy, Vice-Pres. Gen. Mgr., Engine building corp., with he quarters at Paterson, N. J.

The B. F. Goodrich Co., John L. Colly Pres., has been named member of Im-national Chamber of Commerce. Det District of Industrial Products Sales | Wallace J. Habermas, Mgr., Autom Section.

William A. Moore named Plant Mg Inland Rubber Corp.'s new tire factor Ottawa, Ill.

Bowser, Inc., W. Marshall Dale, R

Nash Motors, John J. Young, Cana Representative in chg. of sales.

Vanadium-Alloys Steel Co., Roy C. Kenna, Pres., replacing Floyd Rose, signed. He continues as Chr. of Bo R. B. George, Sales Vice-Pres.; L. D. & man, Production Vice-Pres.; and F. P. derwood, Vice-Pres. and Sec.; J. P. of Vice-Pres. and Chr. of newly formed E which includes F. P. Underw R. B. George, L. D. Bowman and Alexan Nimick. J. Cleveland McKenna was elec Director to fill unexpired term of F

Half of Britain's New **Cars for Export Markets**

Announcements by the Government and various motor manufacturers in cate that the position regarding the duction of new cars in England at moment of writing is as follows:

The Government, acting through Board of Trade and the Ministry Supply, has authorized the product of 200,000 cars by the industry a whole during the next twelve mon (40,000 by the end of this year), without guarantee that essential la and materials will be forthcoming and when required.

Manufacturers are to allocate this production to export markets, for some months to come may not s ply new cars to would-be buyers Britain, except those able to secun "license to acquire" from the Minis of War Transport. The license will granted only where proof is provi that the intending buyer is engaged work of vital national importance whose existing car is beyond repair reconditioning.

Cars will be supplied through red nized dealers, but the Ministry-not manufacturer-will decide who have each available car and will spec the dealer to whom it is to be supply for delivery to a specified person.

The principal manufacturers authorized to recommence product are: Austin, Morris, Standard, Hills and Ford, and the bulk of the out will consist of 8-hp, 10-hp and 12 models, though Austin will comme

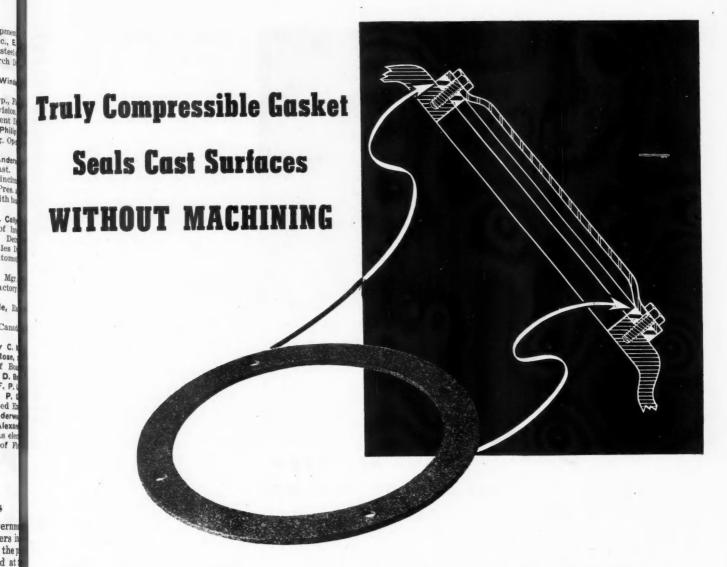
Motor temperature control—as achieved by a Dole Poppet-type Thermostat—is functionally positive—positive, also in its reduction of crank case dilution—and savings of gas, oil and motor wear.

Such plus performance will necessarily be more essential in the finer, high-performance cars of the future.

performance plus



1901-1941 Carroll Avenue, Chicago 12, Illinois



AN electric motor manufacturing company had been using a straight synthetic rubber gasket to seal the cover plates on its waterproof marine motors. Because this gasket was non-compressible, the motor company found it necessary to machine the cast flange surfaces to obtain a perfect seal.

Then they adopted one of Armstrong's Corkand-Synthetic-Rubber Compositions compounded especially for "low pressure" sealing of uneven cast or pressed surfaces. This specialized gasket material, besides being highly resistant to heat, solvents, oil, and salt water, is truly compressible. It is permanently resilient and will not flow under pressure. Consequently, this gasket provided a longlasting, perfect seal between the normally uneven cast surfaces . . . without machining. And not only did the Armstrong gasket eliminate this operation, but it also cost less than the original.

Besides cork-and-synthetic-rubber compositions, Armstrong's complete line of sealing materials includes cork compositions, synthetic rubber compounds, fiber sheet packings, and rag felt papers.

For same-day service on special die-cut gaskets, check with your near-by gasket cutter. Many leading cutters now stock Armstrong's sealing materials. And for specification data on these materials, send today for your free copy of "Gaskets, Packings, and Seals." Address Armstrong Cork Company, Gaskets and Packings Department, 1507 Arch Street, Lancaster, Pennsylvania.

MATERIALS AND SPECIALTIES FOR



AIRCRAFT AND AUTOMOTIVE UNITS

- Tank strap cushions
- Composition roll goods—with or without fabric back, plain or adhesivecoated—used as glazing strip, bind-
- ing tape, cushion pads, and anti-skid flooring.
- Felts for vibration-damping and soundproofing
- Resilient floorings
- Carburetor floats and other fabricated natural or composition cork specialties

ARMSTRONG'S Gaskets, Packings, and Seals

vs:

ugh

istry

oduct

ry as

ar),

al la

ate

ets,

not s

yers

secun

Minis

proving aged

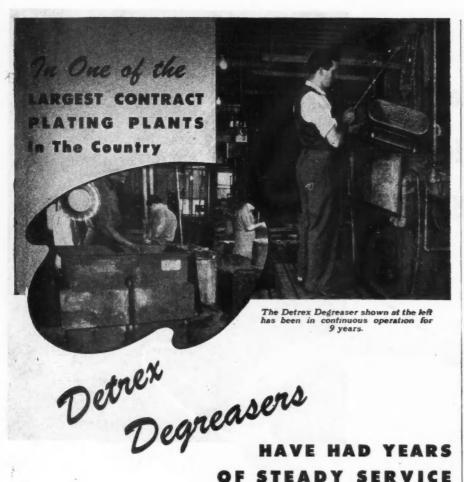
epair
h rea
—not:

no sh l sped suppli

son. ers ti oducti Hillm

e outp

USTRI



The firm of Philip Sievering, Inc., in New York City, has been in business since 1889 and today is one of the largest contract electroplating concerns in the United States. For the cleaning of all types of work prior to plating, anodizing or rust-proofing this concern uses the two Detrex Degreasers shown.

In many other plating plants throughout the country, Detrex machines and solvents provide the thoroughly clean metal surfaces which are so essential as the first step in high quality plating work. Complete details on the equipment best suited for cleaning prior to plating, regardless of production volume, are yours upon request.



deliveries of the new Sixteen in August. Austin will also produce a 10-hp light delivery van and a range of trucks, though the latter come under a separate authorization. Vauxhall will not be producing cars under this program for the time being, as no part of the plant can be made immediately available for ear production. No manufacturer's plant, indeed, can be used wholly for car production, being still required mainly for war work.

For a few months, production in all cases will be on a very restricted scale, from materials in stock, either carried over from 1939-40 or the surplus on hand after completion of limited wartime production on Government account. All models are basically of designs that would have been produced for 1940 but

for the outbreak of war.

Easing of Restrictions

(Continued from page 44)

money as possible for their tin, but they are also eager to maintain the present rate of their shipments to the United States. Recently received issues of London metal publications contain articles indicating that while the wresting of the Malayan tin dredging properties from the Japanese invaders is looked upon as the most important part of the task of regaining Britain's supremacy in the tin industry, this does not prevent British tin smelters and shippers taking a very keen interest in developments at the Texas City plant of the U. S. Government. There is much speculation here as well as abroad as to the post-war status of the Governmentsponsored tin smelting industry, the folding up of somewhat more modest and privately owned tin smelting works following World War No. 1 being still fresh in the minds of many in the trade

Continuance of Spot Authorization restrictions on the use of copper in the manufacture of passenger automobile as well as motor trucks and trailer serves to complicate a situation which had been thought to be on the way to

early adjustment.

First Ford Off Line

(Continued from page 46)

fused to divulge the percentage in crease asked.

Production is expected to be in the "hundreds" in July and in the "thousands" the following month. Distribution to dealers will be on a historical basis of past sales performance. Production also is expected to get under way within a matter of weeks at six Ford branch plants at the prewar ratio. However, since both the Richmond and Long Beach, Cal., plants are tied with war work, distribution on the West Coast will be expensive, since the car will have to be transported from other

On home front and battle front . . . Mercury's superior performance, combined with its inherent ruggedness and most-power-per-pound ratio, insures Kiekhaefer's continued leadership in the 2-cycle engine industry.



CORPORATION • CEDARBURG, WISCONSIN

BUILDERS OF GASOLINE ENGINES EXCLUSIVELY



gust. light ucks, arate t be n for plant e for arer's y for uired in all scale, rried 18 on Warcount. s that 0 but

S

t they esen Inited Lonrticles ng of erties ooked of the emacy t preippers velopof the specuto the ment y, the nodest works g still trade zation in the nobiles

railer

which vay to

9

ge in

in the "thou stribu torical . Pro under at six ratio. nd and

ied m e West ie cars other

STRIES

Outboard Motors • Marine Engines • Portable Industrial Engines • Aircraft Engines • Aircraft Auxiliary

July 15, 1945

When writing to advertisers please mention Automotive and Aviation Industries

87



Photo from European

New Paris Taxicab

This cab, built to accommodate six passengers, almost as low as a jeep. The engine located between the two front seats. Doors are arranged to slide instead of opening outward. The roof is transparent and may be opened part way if desired.

branches, with the Dallas plant the likely supplier.

Henry Ford, II, executive vice-president of the company, stated that his company's allotment could be built normally in less than two weeks, and unless the quotas are increased, it will be necessary to reduce employment by about 50 per cent by Dec. 1. He stated that Washington officials are hampered in their estimates of available materials by incomplete information on inventories and the still uncertain policy of the military as to whether certain equipment will be moved from Europe for the Japanese war or will be replaced by new equipment made in this country.

Four new assembly plants, including Lincoln and Mercury units, will be constructed by the Ford Motor Co. as part of its \$150 million post-war program. Two of the new plants will be at St.

Louis and Atlanta, Ga.

Ford's production plan also calls for separation of Ford and Mercury assem bly throughout the nation and combining Mercury production with Lincoln output. Sales of the Lincoln and Mercury automobiles will be handled by an exclusive dealer organization in the post-war period.

Assembly of Lincolns outside the Dearborn-Detroit area for the first time was decided upon because of the expanded Lincoln Mercury line, and the anticipated post-war market; also, to facilitate deliveries.



PERMANENT MOLD ALUMINUM CASTINGS CAN BE INTRICATE YET SATISFACTORY Let STERLING Engineers Show You How

Many years of designing permanent molds for aluminum castings have made Sterling engineers specialists in this type of work. Designs you may have thought too intricate to cast will be welcomed by Sterling engineers. You may get a solution that will lower your cost and improve the quality of your product.

Why not submit your specifications for today's production or postwar designs.



BOOKS...

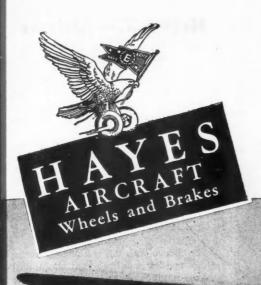
AND INDUSTRIAL ORGANIZATION MANAGEMENT, by Bethel, Atwater, Smith, and Stackman. Pub. McGraw-Hill Book Co. This volume is the most recent addition to the growing literature on management and associated problems. It approaches the subject from the standpoint that management is a specialized field within itself and undertakes its analysis under four major headings. The arrangement of the text is along the following lines: 1. American Industry—history and economic and social background; 2. Organizing the Industrial Enterprise—principles of forecasting, financing, product development, physical facilities; \$ Operating the Enterprise—planning for production, controlling materials, quality control, methods analysis, industrial relations, selling the product; 4. Coordinating the En--consideration of internal and external influences, relation to the national economy and to world economy, public readaptation to changing conditions. Comprehensive in scope, this text should be of interest not only to the advanced student but to the men who make up management.

Offi

HA

TANKS AND ARMORED VEHICLES, by Col. Robert J. Ioks, edited by Phillip Andrews. Pub. Duell, Sloan & Pearce, Inc. Prepared over a period of some years. during which mechanized equipment was undergoing constant change, this volume was finally revised and published just before the end of the war in Europe. fore the end of the war in Europe. The author (then Lt. Col. Icks) has been in an enviable position to survey the development of military vehicles from his station in the Office, Chief of Ordnance-Detroit, where most of the latest equipment originated. This book traces the de-

(Turn to page 98, please)



the resihis uilt and will by ated ered rials ven-

tain cope rethis ling conpart cam.

for sembincoln Merv an the the exthe

AND

nith, Co. n to

and the

and

ajor ct is dusack-

tercing, s; 3.

con-

En-

onal reions.

d be dent

LES, hillip Inc.

ears

was lume

The in de-

his

nce

nt.



ST TO LAND!

Official U. S. Marine Corps Photo

On U. S. 4-engine bombers: Boeing B-29 Superfortress and B-17 Fortress; Consolidated B-24 Liberator and others to come... on transports such as Curtiss C-46 Commando..... Hayes Wheels and Expander Tube Brakes are standard.

This Marine Corps observation plane -- a Consolidated Vultee Stinson L-5 equipped with Hayes Wheels and Expander Tube Brakes -- was first to land on Iwo Jima, on the captured Motoyama airfield.

Hayes Industries is proud to provide "the war bird's feet" on thousands of military and naval aircraft... meeting all loads and landing speeds, ranging from bombers to fighters, from transports to trainers, and on all navy flying boats (beaching wheels and brakes).

Western Representative: Airsupply Co., 5959 W. 3rd St., Los Angeles 36, Calif.

HAYES INDUSTRIES, INC.

Home Office: JACKSON, MICHIGAN, U.S. A.

Large billets are uniformly heated in this EF Rotary.

The above EF Oil Fired Rotary . . .

Heats 35,000 lbs. per Hour

The small EF Electric Rotary below . . .

Hardens 250 lbs. per Hour—Scale Free!

N our files are the designs and complete records covering the thousands of EF Rotary and other continuous and batch type furnaces we have built—the result of over 25 years of practical furnace building experience.

Products ranging from small balls for bearings to structural shapes 90 feet long are being handled in EF furnaces.

This experience is available to you in helping solve your particular furnace problems.

We solicit your inquiries - no furnace is too large or too unusual.

Telephone 4661 Salem, Ohio, or write us regarding your furnace problems. We specialize on building production furnaces,—oil fired, sas fired, or electrically heated.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces --- For Any Process, Product or Production

FURNACES OIL, GAS OF ELECTRIC

For Every Heating and Heat Treating Process

Aluminum Brazing
Annealing
Billet Heating
Bright Annealing
Bright Hordening
Copper Brazing

Carburizing
Drawing
Enameling
Forging
Hardening
Malleablizing
Silver Soldering

Nitriding
Normalizing
Soaking Pits
Scale-Free Hardening
Quenching Machines
Ceramic Kilns, etc.
Process Heating

We Build the Furnace to Fit Your Job
THE ELECTRIC FURNACE CO.
SALEM, OHIO

PURMACES

Dec puro

Model 37—Airliner

(Continued from page 31)

vided into two movable parts, hinged to one another along a line parallel to the normal rudder hinge line. The rear hinged portion has approximately 1/12 the area of the entire rudder and is, in effect, simply a small rudder attached to the main rudder surface. The pilots' controls are connected directly to their smaller surface or serve tab, and due to the small area of this tab, the pilot is able to control its position with the application of only normal effort.

The servo tab is connected to the pilots' rudder pedals so that the normal pedal displacement for right rudder effects a displacement of the servo tab to the left, and vice versa. Since the servo tab is located as far from the rudder hinge line as is practicable, the airload on the tab, resulting from its displacement by the pilot, forces the rudder in the desired direction and turns the airplane. Thus the servo tab has provided a "boost" for the pilot, making it possible for him to fully control the large rudder with Servo tab and rudder are actually interconnected with spring dampeners which tend to center the tab on the rudder, thus damping rudder oscillations. Servo tab boost is provided on the rudder and elevators of the Model 37.

nqui

ire (

Cent

new

n th

TI

but

shar

oad

tode

H C

Jul

S

The ailerons, though controlled in the conventional manner, are comparatively small in area and are not used as the sole means for lateral control of the airplane. These ailerons are called guide or feeler ailerons, for their primary function is to provide the pilot with normal "feel," while the greater part of the lateral control is achieved by "spoilers" with which the guide ailerons are connected. The spoilers are essentially flat metal plates, recessed below the wing surface in slots extending inward from the wing tips some 40 ft and nearly parallel to the rear edge of the wing. These plates are arranged so that coincident with the upward motion of the adjacent guide aileron, they will extend upward edgewise, in amounts varying with the degree of movement of the guide aileron. The spoiler on the opposite wing tip remains recessed in the wing. The projection of the spoiler above the wing surface disturbs the airflow over that wingtip, thus reducing the left as compared to the opposite wingtip, and the airplane is banked in the desired direction. The spoilers are so arranged that their operation imposes no load on the control wheel, and since they alone give no pilot "feel" they are com-plemented with the guide aileron which, as stated before, serves this purpose.

An advantage of the spoilers feeler aileron system is the fact that nearly 85 per cent of the wing trailing edge

Holley CENTRI-VAC



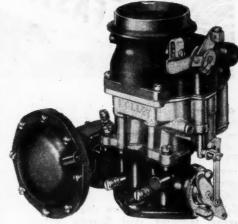
nquiries continue to pour in! Fleet operators everywhere are expressing keen interest in this "new principle" engine governor — the Holley Centri-Vac.

Commercial vehicle operators in all fields are asking for Centri-Vac engineering data — for information on how this new Holley carburetor-governor may be adapted to trucks in their fleets.

This innovation in governors, controls engine speed withput surging, loss of power or sluggish pickup. By providing sharp, positive control of engine RPMs, it gives better average road speed.

Save and protect your hard-to-replace equipment! Write today for complete engineering data.

HOLLEY CARBURETOR COMPANY
5930 Vancouver Avenue, Detroit 4, Michigan



- Reduces Accidents
- Saves Engine Wear
- Cuts Repair Costs

HOLLEY

AIRCRAFT • AUTOMOTIVE • MARINE
CARBURETORS AND ACCESSORIES



July 15, 1945

r

nged el to rear 1/12 d is, atface, l dierve this posinorthe rmal dder tab the the , the the and ervo

the n to with are oring e tab

pros of

d in

araused

ntrol

are

pilot eater

eved

ilers

slots

tips the

lates

with

acent vard,

the guide osite

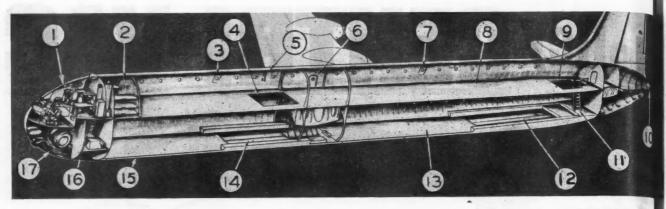
ving.

over ft ms and sired nged load they comeron this

eeler

RIES

When writing to advertisers please mention Automotive and Aviation Industries



COSTS! COSTS!

Wherever your new car designs now call for a jam nut—lockwasher and nut—plain washer, lockwasher and nut . . . replace with a single, inexpensive self-locking PALNUT. This saves 50% in time and labor—cuts fastening weight 60-90%—reduces space, while providing vibration-proof security.

Self-Locking PALNUTS are single thread, spring tempered steel locknuts, easily, speedily applied with hand or power drivers. They are very low in cost, light in weight, require only 3 bolt threads space.

Self-Locking PALNUTS are available in many types of various applications, in a wide range of standard sizes. Send details of your assembly for test samples and data. Write for Palnut Manual No. 2 showing principle, advantages, application, sizes, etc.

THE PALNUT CO., 60 Cordier St., Irvington 11, N. J.





When the PALNUT is tightened, its arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt thread and downward on the part (A-A), securely locking both.

PARTS · COSTS!

Fastening Radiator and Trunk

Medallions — Glove Compart-

ment Door - Instrument Clus-

ter-License Bracket-Mould-

ing Strips - Engine Coil

Mounting—Choke and Throt-

tle Dash Mountings -- Instru-

ment Assembly, etc., etc.



Cutaway of XC-99 Cargo and Troop Transport

1. Flight deck; 2. Crew's quarters 5 to 3. Exit; 4. Cargo hatch; 5. Monorail on decks hoist and control cable; 6. Access to top of wing both sides; 7. Emergency both sides; 8. Upper cargo deck; 9. O hatch; 10. Observation cone; 11. Stain 12. Cargo loading ramps; 13. Aft lowers deck; 14. Forward loading ramps steps into under side of ramps. Reverse ram use as stairs; 15. Forward lower cargo 16. Stairway; 17. Nose wheel comparts

This cutaway view shows the fuse arrangement of the XC-99 transmilitary version of the 204-passed Model 37 airliner described on a 32 of this issue. As a cargo plane XC-99, which is being built at the Diego plant of Consolidated Valuell carry a payload of 100,000 be a distance of 1500 miles. Loaded 19,000 gal of fuel it will have a muith reduced payload, of about miles. The fuselage is c om plete double-decked and has two large mat the bottom for loading.

may be utilized for wing flaps. In airplane the wing flaps compan area to the wing of a small sport pl and are recessed into the lower sur of the wing trailing edge so as to m tain the airfoil section of the when in their retracted position. takeoff and during landing these are deflected downward and slig away from the wing so as to effect increase over the normal wing The additional lift produced pe the airplane to take off and land low speeds which would not sustain airplane in flight with only the nor wing area. Among other advanta gained by the use of flaps is a subs tial reduction in landing and tal run, thus permitting the airplane operated from smaller airports otherwise would be possible.

The electrical system power is b ally 220 volts, 400 cycle, three-phase ternating current and is supplied three 50-kw alternators. Such di current and/or lower voltage power quired is furnished by motor ! erators or transformer rectifiers ating from the basic power. 150-kw capacity of the alternator sufficient to provide 100 per cent sta by for all normal electrical power quirements and 200 per cent stall for the power essential to the flight the airplane. The power distribut system consists of some 25 miles wire strung about the airplane as



... of a more successful design for your product, with new adaptations, new uses, and new possibilities. For the types of ends possible on torsion springs are practically unlimited in size and shape. But engineering the best spring end for your application requires experience in design—

making it calls for great skill in tooling, and extensive production machinery. That's exactly why you should turn to Muehlhausen engineers for solution to your difficult spring problems.

MUEHLHAUSEN SPRING CORPORATION

Division of Standard Steel Spring Company
650 Michigan Avenue, Logansport, Indiana



Cargo Ort

rs 5 but
rail on h
Access
rgency
r; 9. Ca
Stain
ower a
steps h
se ramp
cargo d
mpartm

transponder on plane of the state of the sta

e a m out a plete

s. In

er sur s to m the wition. hese fid d slight effect ring and pend d land ustain he non

dvanta a subs

nd take

lanet

orts

r is b

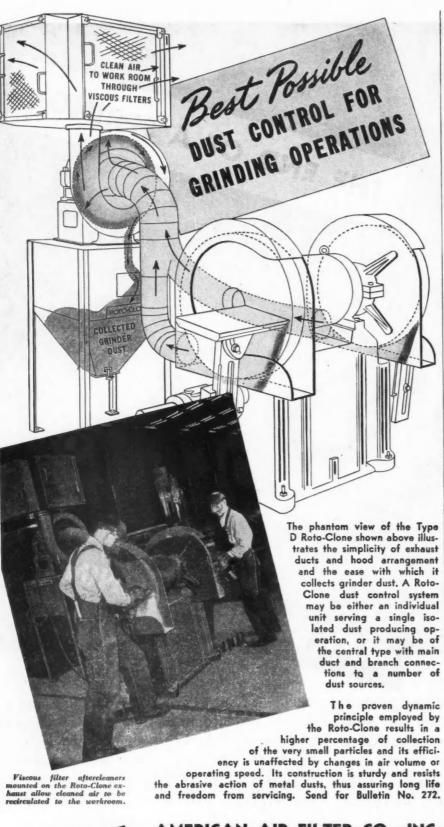
-phase

pplied nch di nower otor

iers of ver. rnators ent sta

t stande flight stribut miles me as

NDUSTR



AMERICAN AIR FILTER CO., INC.

449 CENTRAL AVE., LOUISVILLE 8, KENTUCKY Canada: Darling Brothers, Ltd., Montreal, P. Q.

quired for the various motors, actuators, radios, lighting systems and so forth. Circuits are elaborately protected by fuses and circuit breakers These are located in junction boxes and panels arranged for ready access to flight or on the ground.

The use of hydraulic power in the Model 37 has been confined to only four major operations-extension and retraction of the main landing gears, actuation of main wheel brakes, extension and retraction of the nose landing gear, and nose wheel steering. It should be noted that the first two functions apply to each of the main land. ing gears and the latter two to the nose landing gear. Hydraulic power is provided by "package" units, each consisting of an electric motor-driven hydraulic pump and a reservoir, and of sufficient capacity to supply any one of the hydraulic actuations required. Being small in size, these package units can be located closely adjacent to each of the hydraulic operations, reducing fluid lines to a matter of inches rather than feet in length.

Due to their light weight, it has been possible to install duplicate units for each hydraulic function, thus providing 100 per cent standby, and at less than the weight of the conventional central system with its extensive and sometimes troublesome plumbing. Control of these units is provided electrically from the pilot's compartment through the use of solenoid valves lo-

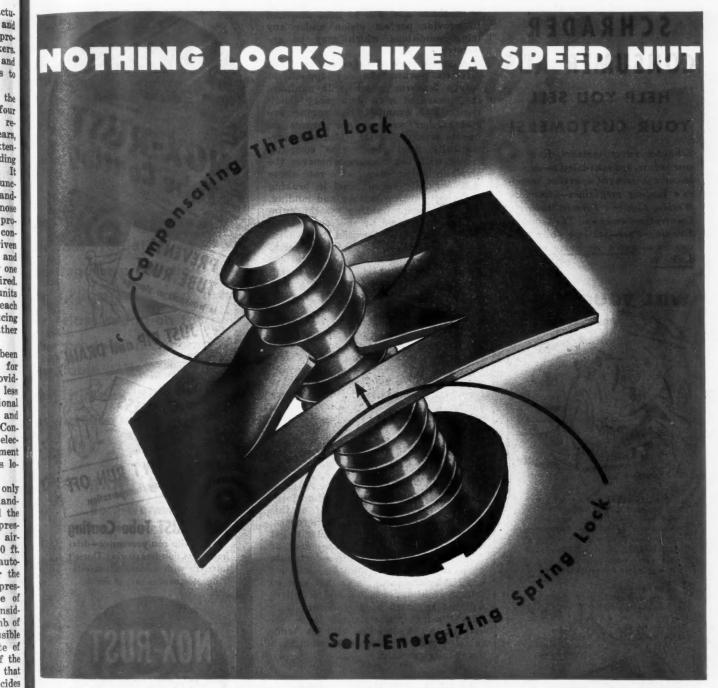
cated at each unit.

The entire fuselage, excepting only a small recess built over the nose landing gear and that portion behind the tail, is pressurized to provide a pressure altitude of 8000 ft while the airplane flies at an altitude of 25,000 ft. The control of this pressure is automatic, however, it is possible for the flight engineer to set the cabin pressure regulators so that the rate of climb in the pressure cabin is considerably slower than the actual climb of the airplane. Contrawise, it is possible to create a slow, comfortable rate of descent in the cabin in advance of the actual descent of the airplane so that the increasing cabin pressure coincides with the outside pressure only shortly before the airplane is landed.

A completely controllable heating and ventilating system will provide a comfortable and adequately ventilated cabin at outside temperatures as low as minus 70 F. The air will be introduced without perceptible drafts and will be discharged through sufficient outlets to assure at least 10 complete air changes per hour. Galley, pantry, lounges and toilet areas will be separately discharged to prevent contami-

nation of the cabin.

The wing and tail will be protected against the formation of ice by the use of a heated air system in the leading edges. This type of anti-icing has been used on Liberator bombers, Liberator Express and Catalina airplanes for the last two years and has proved to be completely satisfactory. The pilots'



SPEED NUTS are the only fastening devices that provide a COMPENSATING thread lock and a SELF-**ENERGIZING** spring lock. TWO distinct forces are exerted on the screw, as the SPEED NUT is tightened.

First, a compensating thread lock, the two arched prongs moving inward to engage and lock against the root of the screw thread. These freeacting prongs compensate for tolerance variations, and function perfectly on oversize or undersize screw or bolt threads.

Second, a self-energizing spring lock, created by the compression of the arch in both the prongs and base. The combined forces of the thread lock and spring lock definitely eliminate vibration loosening.

SPEED NUTS, proven in pre-war commercial industry and now boosting the production of airplanes, are ready to assist you in the assembly of post-war metal, vitreous enamel, plastic or wood products. Literature is available on over 3000 shapes and sizes, for standard or special assemblies.

TINNERMAN PRODUCTS INC. Cleveland 13, Ohio 2059 Fulton Road



ctn. and pro-

ers. and s to

re-

ars, ten-

It uneandnose procon-

one red

ortly

ating

de a lated

low

ntro-

and cient

plete

ntry,

sepa-

tami-

ected

e use ding been rator r the to be ilots'

TRIES

SCHRADER CONSUMER ADS

HELP YOU SELL
YOUR CUSTOMERS!

Schrader advertisements, like the one below, are scheduled to appear in current issues of several of America's leading magazines—American Weekly, Capper's Farmer, Collier's, Country Gentleman and The Saturday Evening Post—telling your customers to get a set today at your dealer's.



Be sure their tire valves are sealed with Schrader airtight Caps. Make sure your stock is complete. Order today.

Always "recap" the tire valves

A. SCHRADER'S SON

Division of Scovill Manufacturing Company, Incorporated,

BROOKLYN 17, NEW YORK

windshields also will be heat anti-iced to provide perfect vision under any icing conditions which may be encountered.

A great amount of effort has been directed toward the development of safety features which will minimize the hazard of even emergency conditions. For example, the engine fire extinguisher system incorporates an inertia actuated device which will automatically flood the engine compartments with inert gases whenever the airplane is decelerated at a rate above that normally encountered in braking the wheels during taxiing and landing. An independent lighting system, automatically actuated by the same device, will indicate the location of several emergency exits. All interior furnishings are made of flame-proof materials. Fuel dumping provisions will completely empty the fuel tanks in a matter of minutes, thus permitting the full fuel tank capacity to serve as flotation in the event of an emergency landing at sea. Twenty-three life rafts, located at convenient exits, will provide additional security. Actually, every feature in the design of the entire airplane will have received careful scrutiny to assure safe and satisfactory service in even the most adverse operating conditions.

Willys Plans to Build Civilian Jeeps

Willys Overland Motors, Inc., is planning to build 3000 to 4000 civilian jeeps a month during the last half of this year, according to Charles E. Sorensen, president. Production is expected to get underway shortly after the first of August. The company is in a fortunate position, since the civilian jeep will use practically the same parts that now go into the military version, and suppliers will not be much of a problem. It is understood that the civilian jeeps will be built on the same line with the Army vehicles, orders for which were cut back drastically recently.

Republic Industries and Jacobs Engine Co. Merge

The merger of the Jacobs Aircraft Engine Company into Republic Industries, Inc., of New York, was announced following the filing of articles of merger in Harrisburgh, Pa. Hereafter the Pottstown aircraft engine plant will be known as the Jacobs Aircraft Engine Company, a Division of Republic Industries, Inc.

Advisory Committee Formed

OPA has announced that an automotive parts industry advisory committee has been organized to work with and advise that agency on pricing policies and regulations during the reconversion period. Ten of the 12 members of the committee now are members of the WPB industry advisory committee representing parts distributors.



Bed

clu

OUI

line

firs

ian

ave

me

ass "G

LO

Jul

Ready to Go!

Because war requirements called for clutches, radiators and oil coolers—our regular production—our assembly lines, jigs, tools and fixtures are in first-class condition for postwar civilian production when materials are available. War-stimulated improvements in manufacturing methods also assure even better Long products when "Go Day" comes.

LONG MANUFACTURING DIVISION

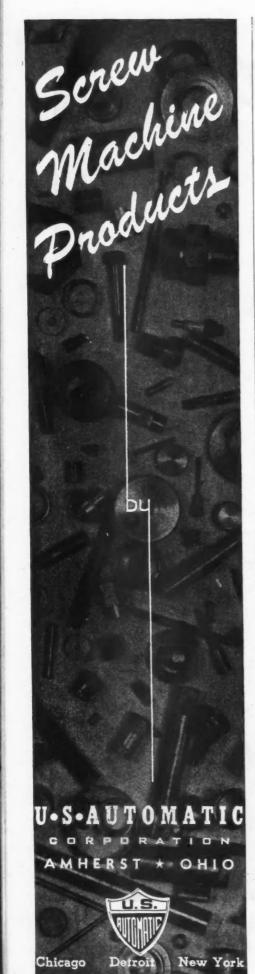
Borg-Warner Corporation

DETROIT 12, MICHIGAN . WINDSOR, ONTARIO

CLUTCHES - RADIATORS - OIL COOLERS



IES



BOOKS

(Continued from page 88)

velopment of armored vehicles from the early war chariot to the present day tank. The initial chapters cover history and development prior to World War I and trace the basic elements of design and construction. Individual treatment is given to the vehicles built in each country—U. S. A., Great Britain, France, Germany, Italy and others. Each of these chapters is supplemented with an analysis of design and pertinent mechanical specifications data. Being authoritative in its background, this book should provide an invaluable reference medium for the general reader as well as the military expert.

MASTERS OF MASS PRODUCTIONby Christy Borth, pub. Bobbs Merrill. The American genius for productive effort, the creed of mass production and interchangeable manufacture, the energy and ability that is peculiarly Detroit—all of this background was brought to bear almost overnight in helping to win the war in Europe. The story of American enterprise from The story of American enterprise from its earliest beginnings to the period of the great World War has emerged from the pen of a writer who has lived with the automotive industry for many years and is associated with the Automotive Council for War Production. The narrative has been skillfully developed in two major sections. tions. Book 1 traces the history of the pioneers, many of them obscure, and is arranged in three parts—the story of William S. Knudsen, who emerged as a William S. Knudsen, who emerged as a three-star General, "My Business is Making Things"; Albert Kahn, the designer of functional buildings, "Master of Space and Time"; C. E. Johansson, of Jo-Block fame, "Absolutely Accurate." Book Two turns to the war when all of the background of American enterprise was harvessed to of American enterprise was harnessed to the business of making the weapons of war. It's the epic of guns and ammunition, tanks, trucks, boats, engines, ammunition. With guns he couples men like Dave Wallace and Henry Kreuger, the mechanical genius. There is the history mechanical genius. There is the history of the Jeep with some sidelights on its earlier relatives. Planes and engines—Sorenson and Willow Run. Written in easy style and replete with background history while it was being made, this book should make good reading for everyone concerned with the automotive industry and with its leaders—large and small.

Many Vehicles Lost in Campaign Against Germany

Nearly 75,000 general purpose vehicles and 16,159 combat vehicles, including 4462 "General Sherman" tanks, were destroyed or junked in the campaign against Germany, according to figures released by the Ordnance Department.

These figures include vehicles completely written off the books and not the thousands of vehicles that were repaired and salvaged.

The lowly jeep carried the brunt of the losses among the general purpose and combat vehicles. In the 11 months of battle, there were 25,781 jeeps destroyed through a variety of causes, including direct hits, mines, plane action and road accidents.

Next in number of losses was the 2½-ton general purpose truck with 19,-664. Approximately 1500 medium tanks were lost. Half-track vehicle losses were 1964. Small amphibious cargo carriers, nicknamed "Weasels," sustained 1137 losses.



This outstanding war development made possible by Oakite CrysCoat No. 86, has a wide application on peace-time products fabricated from steel or iron to which paint or similar organic finishes are subsequently applied.

In ONE low-cost, time-saving operation, Oakite CrysCoat No. 86 removes light oils, grease and shop dirt, imparts a microscopic crystalline coating to steel or iron surfaces which prevents rusting and at the same time provides excellent, firm grippage for paint.

FREE Service Report Gives You All Details

Safe to product and the equipment in which it is used, Oakite CrysCoat No. 86 is economical to use, speeds production, eliminates paint adhesion failure due to incorrect surface preparation. Write for FREE Service Report giving essential details.

OAKITE PRODUCTS, INC. 34E Thames St., New York 6, N. Y. Technical Service Representatives Located in All

Technical Service Representatives Located in All Principal Cities of the United States and Canada



GOES PRODUCTION!
GOES COST!
WITH HANSEN
COUPLINGS

• In tomorrow's market, "costs" will be a big factor, not just a talking point, because competition is going to be two-fisted and short-cuts all along the line of manufacturing in the way of savings will be the smart order of the day. Hansen Push-Tite Air Hose Couplings are triple "savers". They save time... save effort... save air and with all this saving comes far greater production.

Hansen Push-Tite Couplings are fast, simple and easy to operate, slight push of plug into socket, it's connected, locked and air is automatically turned on. Slide sleeve back with thumb, it is disconnected and air is automatically turned off. Hansen Couplings will take pressures from 2 ounces to over 10,000 pounds without leaking. No twisting or turning in order to lock or unlock, full swivel action prevents kinking of hose. No pins to bend, break or jam, all parts are fully protected.

Hansen Couplings are made for air, oil, grease, gasoline, acetylene, and oxygen. Send for free industrial catalog covering the complete line of Hansen equipment.

THE HANSEN MFG. COMPANY
1786 EAST 27th STREET
CLEVELAND 14, OHIO

Buy an extra War Bond

COUPLING

GASOLINE

OXYGEN

COUPLING



BLAKESLEE Solvent Vapor Process

All types of industrial metal cleaning can be handled quickly, thoroughly, economically the Blakeslee way—large parts or small—oils, grease and chips are removed. Results are dependable . . . satisfaction is assured . . . substantial savings are certain.

Why not call Blakeslee when you are faced with a degreasing or metal cleaning problem? No matter what the possible application may be, there is Blakeslee equipment to suit your needs. Write today for your copy of our new booklet, "Solvent Degreasing."

Solvent Vapor DEGREASERS **Metal Parts Washers**

S. BLAKESLEE & COMPANY G. S. BLAKESLEE & CONTROL Main Office and Plant: Cicero Station, Chicago 50, Illinois
Toronto, Ont.

Standard Units and Specials ENGINEERED for YOU:

High Prices will Restrict Sales of Cars in England

At a recent Press conference, Lord Perry, chairman of the English Ford Co., answering a question about the prices of new cars in England, said he did not think that there would be a public demand for cars at the prices that manufacturers would be compelled by the purchase tax to apply to them. What with this tax and ordinary car' taxation at the present rate, he added, the Chancellor of the Exchequer has passed the point of the law of diminishing returns. There would not be many buyers, he thought, at £300 for a car which sold in 1939 at £150 or less.

Lord Perry was asked about the Ford plant at Cologne, and said that it had escaped serious damage and was now producing about 10 trucks a day for the Allies, compared with 70 vehicles of all types a day before the war. It has operated and paid a dividend during the war and had not been taken over by the Nazis, any more than the English plant at Dagenham had been controlled by Mr. Churchill. The Ford Co. held 60 per cent of the capital and 40 per cent was German capital. Regarding the English Ford plant, Lord Perry said that although it would be producing some new cars this year, it would be engaged up to two-thirds its capacity during 1945 on vehicles and components for military use and on tractors; 150,000 of the latter had been produced at Dagenham during the war and the company had recently been authorized to produce another 50,000.

Propane as a Cutting Gas

The monthly periodical "Production and Engineering Bulletin" issued by the British Ministeries of Labor and Production reports that propane is being used in place of acetylene as a cutting gas. The following are some advantages claimed for propane. One cylinder of propane will do as much cutting as several cylinders of the same size containing dissolved acetylene. Propane has a higher caloric value; the cost for equivalent heating value is less than that for acetylene.



by Patented Process U. S. Pat. 2,351,741

16

Factory Branches Jobbers

Everywhere

DS for Production

(Trade Marks Registered)

RE-SET-ABLE . BIG-HED-NIB

RE-SET-ABLE adds to life of your diamond ... More work per carat. Exclusive pat-ented setting is tender to the diamond ... Holds firmly . . . Protects from damage . . . Guards against breakage.

No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment... Tools numbered in units of ½ carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service \$1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

"RE-SET-ABLE" **Diamond Tools** on Your **Precision Grinding Production Line**

Equip Now

SHELDON M. BOOTH, Pres DIAMOND TOOL COMPANY, Not Inc. 938 E. 41st Street CHICAGO 15, III. J&L STEEL

es ed n. ar d, as n-oe or s.

is y e-

d ne nd d e d e it s d n n r

y

e |-



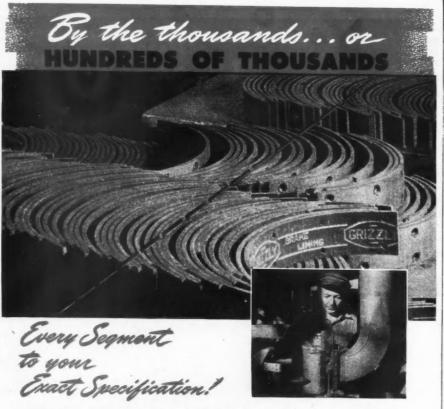
古出達計畫

produced by the teamwork of science and skill

— piloted by research.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA



Twenty-nine years of intensive braking study, continuing engineering and diligent research . . . all this has ably qualified us to produce precision-machined moulded brake lining, segments and blocks to meet most exacting specifications, not only by the thousands, but if you please, by the hundreds of thousands.

Pioneers in advanced production techniques, Grizzly long ago learned the importance of producing the best product, most economically . . . that's why Grizzly is known as "the finest product of the Brake Lining Industry."



Your copy of "Building UP to a Name" is ready for you. Write for this instructive photographic record of modern brake lining manufacture.

Grizzly Manufacturing Company, Paulding, Ohio.



Standardization of Aircraft Structural Components

By 1939 when large-scale manufacture of planes for export was envisaged, the growing complexity of aircraft construction had multiplied individual differences to a point where few part were interchangeable on any similar type of plane. This was particularly notable in the case of extrusions, which require special dies for each of the numerous shapes required. Such dies are the exclusive property of the vanous companies, many of which in 1930 possessed up to 700 or 800 dies accessible to no outside company.

Attempts to create an industry-wide pool of extrusion dies failed, until the National Aircraft Standards Commit. tee was formed, John T. Thompson, na tional chairman of the committee stated at its ninth semi-annual meeting, recently. Cooperative action then made thousands of non-restricted type dies available to every company in the field A project was also undertaken to draw up recommended standards for a series of popularly used structural shapes such as angles, channels, Z's, T's, etc. When completed, the standards proved so satisfactory that they were agreed to by most companies, and were actually adopted without change by military authorities as joint Army-Navy standards.

As to procedure, a certain company is given the task of developing a particular standard, with several others assigned to advise and assist. Tests are conducted in the individual plants, and results submitted in report form for vote of the entire committee. Every project undertaken must deal with a production or engineering problem common to a majority of the member companies; but no attempt is made to restrict findings to these companies alone.

Since Pearl Harbor the NASC has assisted in devising production methods for putting current Army-Navy standards into practice, and in addition, has been officially charged since 1941 by U. S. Government agencies with responsibility for developing new industrial standards supplementary to already existing Government standards





"NATIONAL" TECHNICAL SERVICE SCORES AGAIN

This is a hose clamp screw—very important in the aircraft industry. It used to be made in two pieces, (1) an expensive screw machine part with a very difficult thread to cut, and (2) a stamping.

After effecting several material savings in the original design, we finally developed a method by which we upset, shave the grooves, flatten the head and roll the thread... producing a *one-piece unit* instead of a two-piece assembly.

The new part is stronger—better in every way—and costs less than half what the other cost.

This is a typical example of how National Technical Service finds ways to make better fasteners, in greater quantities, at lower costs. Let us have your inquiry.





THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

com-

to realone.

ethods stand-

n, has 41 by

h re-

industo al-

dards

TRIES



- Small and compact in size . . . efficient and powerful in action.
- Precision workmanship assures long service without frequent parts replacement.

Besides operating BUELL AIR HORNS, Buell Air Compressors have many uses including: • Tire Inflation • Spray Guns and Cleaning • Air Brake Equipment • Air Operated Vises • Used in conjunction with Air Operated Doors, etc., etc. Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.

Write us, advising all details as to volume, pressure, etc., and our engineers will gladly aid you with your problem.

BUELL MANUFACTURING CO. 2975 COTTAGE GROVE AVE., CHICAGO 16, ILL.

OPA Price System

(Continued from page 17)

practically none of them will be a plicable to the job in the transition period. Initial resumption of pan manufacture will be with the same typ of tools and materials used in 194 and it will be only when new mode and new materials are developed that they can take advantage of warting

improvements.

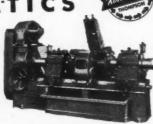
Negotiations on pricing of pan have been going on between the industry and OPA for several weeks. It not a question of receiving an increase (OPA already has agreed to that) by of how much and how it is to be deter mined. Parts men say the top strate of OPA is sincere and sympathetic; its desire to help the industry get fair price. However, that agency still is unconvinced that labor efficiency i down and that all costs, both direct an indirect, should be considered. OP has proposed that percentage increase in labor and materials be determine on an industry-wide basis and that the increase factor be applied uniformly all companies and products. Pan makers oppose this vigorously because of the heterogeneous nature of their dustry and the wide disparity between manufacturing costs of different cor panies and between different product in an individual company. centage increase factor for axle hou ings compared with valves, for e ample, might vary widely because t ratio of labor to material for the la ter is much greater than for an housings.

The difficulty in obtaining accurate cost data also is a tremendous job, at is complicated by the fact that man manufacturers no longer have adequate records of their 1941 costs. Another factor that works against this plant that in many cases the March, 194 price, which now represents the ceiling does not reflect costs at that time to cause the manufacturers had not marked up their product to compensation cost increases. OPA is reported to currently planning to sample a contract of the cost of

(Turn to page 106, please)



When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. Bulletins 110 and 120 are available for suggested solutions to your problems.



No. I-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin



Style B' DRILL CHUCKS

FOR A POSITIVE DRIVE in any machine having a Morse Taper hale in the spindle. Collect action, transpend and ground, concentric within .002" and designed to allow close-center multiple drilling. Furnished in Morse Tapers 0 to 5, accommedating drills from #60 to 1%" diameter. Style "B" Drill Chucks are now standard equipment in plants of many leading auto-

equipment in plants of many leading automobile and airplane manufacturers. Economize by including them in your production tooling setups—for jobs of tomorrow.

SCULLY JONES

July 15, 1945

m

be ap ansition part me typ

n 1941 mode ed th vartin par indu ncreas at) b e dete strat hetic 7 get icy stil ency ect an creas ermine hat th rmly Par becan the i betwe nt co roduc he pe e hou for e use t the k or ar CCUra ob, ar dequa Anoth plan 1, 194 ceilin ime l

not y

eport

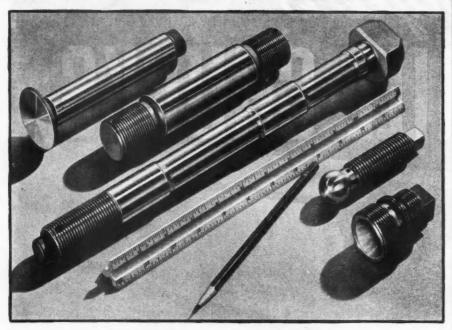
a cro

STRI

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

105

BIG STUFF



Long years of experience have enabled The Chicago Screw Company to turn out millions of precision made screw machine products regardless of size, shape or form.

Illustrated above are a few of the larger hardened and ground screw machine products which we manufacture to exacting specifications. While we handle all types of screw machine and cold upset parts from the simplest to the most complicated, it is on the really tough jobs that we can demonstrate the full value of our experience, engineering ability and most modern production fa-



cilities . . . Remember "Chicago Screw" when you need close tolerance, precision made screw machine products.



THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 SO. HOMAN AVENUE CHICAGO 24, ILL.

section of the parts industry by questionnaire in an effort to see what labor and material cost increases are percentagewise.

For their part, industry spokesmen have asked OPA to approve a pricing formula under which each manufacturer would be allowed to determine his own cost increases in material, labor. and all overhead and then add a percentage of profit markup equivalent to that in a mutually agreed upon prewar period. They also have suggested that the base period should be a wide one, such as 1935 through 1941, and that each company be allowed to pick the three best years, not necessarily consecutive. The formula would be applied, at the option of the manufacturer, on a company-wide, productgroup, or individual-product basis. The industry is willing that OPA retain its policing powers so that any company which overpriced its product could be cited for violation, thus safeguarding the public interest. Another check on the parts makers would be the highly competitive situation existing in the parts field, since any manufacturer who set his prices out of line likely would lose out to a competitor. Also, the car manufacturers hold the aces, because their output is limited, while the parts makers have capacity for more than the industry can use, at least at the outset. As a result, the vehicle companies can shop around for the best price on components.

This

tou

eral

chi

the

ma

Usi

fal

inc

3/1

sto

for

cut

Although no definite action has been taken at this writing, OPA has promised some decision soon. However, the parts makers have pointed out that even if a favorable pricing formula is forthcoming, they still cannot figure prices until OPA sets its policy on pricing such items as gray iron, steel castings, forgings, malleable iron, and screw machine products which the industry purchases. Imminent action on this also has been promised.

Despite the lack of any pricing formula, the vehicle manufacturers are asking old suppliers to accept orders. A few parts manufacturers are waiting until a formula is set, but most of

(Turn to page 108, please)



• POSITIONS OPEN • DIESEL ENGINEERS

DESIGNERS and DRAFTSMEN
FOR DEVELOPMENT WORK

ON

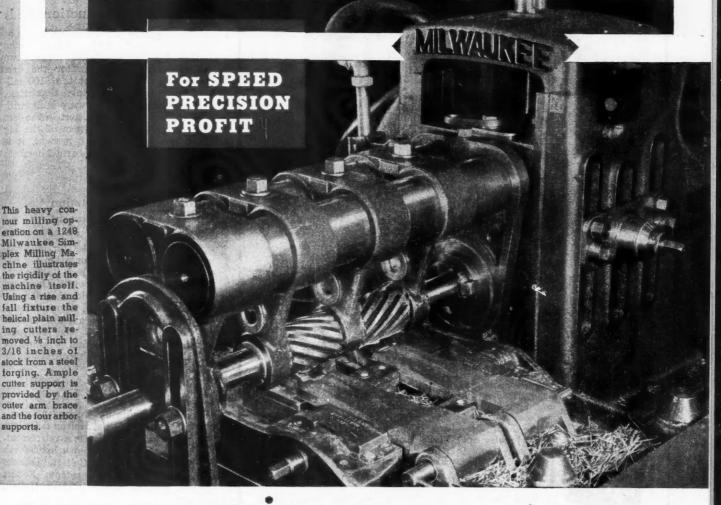
New High Power Engine POST-WAR POSSIBILITIES

Eastern Location Address Box 27; care of this Magazine

Statement of statisticity required.



YOU CAN SAY THAT AGAIN -"PUT IT ON A Milwaukee



Often called "production type milling machines", the Milwaukee Simplex Series machines are designed for strength, compactness, and rigidity to withstand the strain of continuous quantity production.

Spindle construction is such as to provide greater range without sacrifice of rigidity. Basically designed for climb milling, this machine is equipped with an adjustable nut and ground screw to eliminate back-

lash in both directions of the table. Workpieces, ordinarily difficult to hold, are milled at faster feeds, with smoother finish and increased cutter life.

Write for new descriptive Bulletin B20 giving complete details on the Milwaukee Simplex and Duplex Series of Milling Machines.

Over-all view of the Milwaukee Simplex machine used on the above milling operations.



Milwaukee Machine Tools

es-

or er-

nen ng ac. his or, erto ed ide nd ck ily

pac-

is.

reny e-

he

in

er

ly

0,

le

or

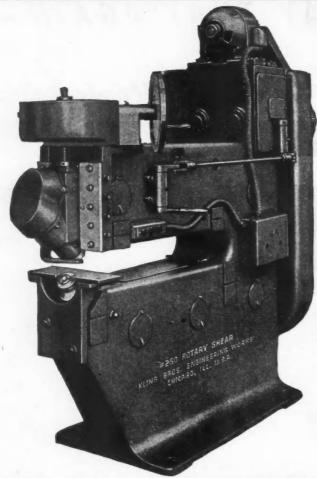
n

n-

ıe

at is

supports.



LOW COST OF OPERATION

makes the Kling Rotary Shear the first choice today of industrial plants. Extensively used in the automotive and aviation industries, the Kling Shear saves time, space, and labor by doing the work of many machines. Does all these jobs. (1) Cuts circles (2) Cuts straight lines

(3) Cuts rings—small or large radii (4) Makes flanges (5) Joggles and Offsets (6) Cuts odd shapes (7) Bevels of any angle (8) Cuts reverse curves (9) Beads & U's (10) Cuts holes without cutting in from edges.

INVESTIGATE NOW

Write today for free Bulletin No. 245. Sent without obligation or cost.

KLING BROS. ENGINEERING WORKS

1318-A3 No. KOSTNER AVE., CHICAGO 51, ILLINOIS EXPORT DEPT., 1111 SO. FERRY BLDG., NEW YORK 4, N. Y. price will be settled later, or agreeing to furnish the components at present legal ceilings, with a proviso for later adjustment. In any event, they are acting on years of experience dealing with the automobile companies and are taking the orders on good faith.

them are either taking commitments on an "open price" basis, under which the

Ford's B-24 Production Ends

The last B-24 Liberator bomber to be built by Ford Motor Co. rolled off the Willow Run assembly line June 28, two years and 10 months after the first plane was turned out at the \$100 million installation. During that time, 8685 of the large ships were built, with 3685 of this total turned out in the last year. Plans for the future of the big plant are indefinite. At present, it is understood that many returned bombers are being stored there.

Automatic Transportation Co. **Opens Export Department**

To better serve the increasing demand in foreign countries for its products, Automatic Transportation Co. has organized and established its Export Department at 431 South Dearborn Street, Chicago, Ill., under the management of Carl M. Wynne, who is a member of numerous foreign trade organizations-a director of the National Foreign Trade Council and president of the Export Managers Club of Chicago.

Sh

na

m

Cr

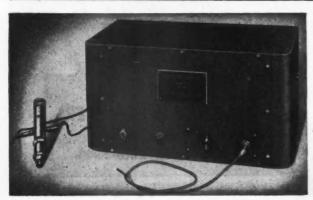
Ch

Advertising Note

J. Horace Lytle has retired as president of Kircher, Lytle, Helton & Collett. As a result of Mr. Lytle's retirement, the new firm will be known henceforth as Kircher, Helton & Collett. Officers are: Ralf Kircher, president; Robert Collett, secretary, and Carter Helton, treasurer.

Mr. Lytle will continue his association with the advertising firm in an advisory capacity and in performing special services.

Now! You can see PRESSURE-TIME-CURVE instantly!



Any Internal Combustion Engine Pump pump — any pressure system. Either static or dynamic pressures.

New! PRESSUREGRAPH

Pressure-Time-Curve-Indicator used by leading manu-

Pressure-Time-Curve-Indiana facturers.
Save time—insure utmost dependability with this new simplified instrument. Instantly indicates pressure, in linear response on screen of cathode ray oscillograph. EASY OPERATION—ONE MAN CONTROL. Pickup section (at right) inserted in cylinder, chamber of airline, etc. Amplified response transmitted to screen.

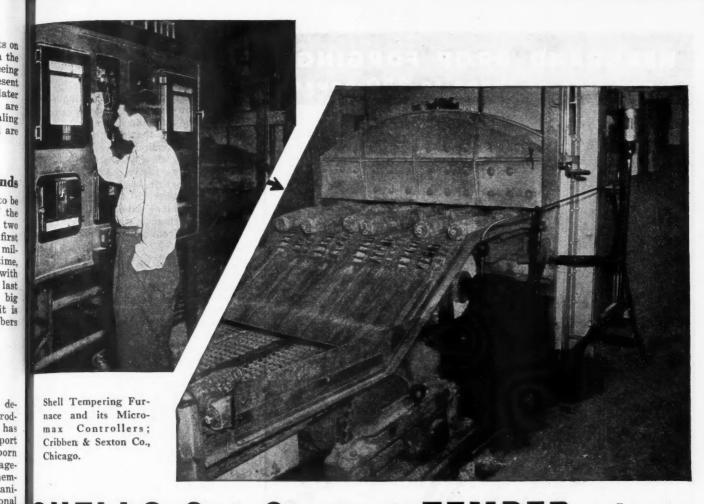
screen.
Get facts on PRESSUREGRAPH'S successful use with C.F.R.
Aviation fuel test engines, also 2-cycle engines for pressuretime-curve of main cylinders and crankcase. Write or wire manufacturers for full details.

FICGSTO

PRODUCTS LABORATORIES 549 W. Randolph St., Chicago 10, III. **PHONE STAte 7444**



rl Ju



SHELLS Get Correct TEMPER-ature In This Micromax-Controlled Furnace

The tempering of shell forgings in the Chicago plant of Cribben and Sexton Co., peace-time manufacturers of Universal Gas Ranges, is quite a change from that Company's normal production; but the job of controlling the furnace temperature in this new work is a detail about which Cribben & Sexton has not hesitated.

The Company has "always" used Micromax Pyrometers to maintain uniform temperature of furnaces in which the enamelled parts of Universal Ranges are fired. The resulting uniformity of enamel is definitely a part of the high quality of the Universal line, and Cribben & Sexton knew that shell production could profit directly by Universal standards of dependable uniformity. Therefore, Micromaxes regulate both hardening and tempering of shells, and results are uniformly excellent.

Ability to stay dependably on the job is probably the chief quality which makes Micromax so good for busy, war-rushed plants. It normally runs for days at a time with no attention at all, and then five minutes' servicing starts another cycle. And the fact that the Controller is available in 5 models enables the specifier to select one to meet his particular need.

Catalog N-33A describes Micromax Pyrometers for thermocouples and will be sent on request, but if you have an active problem in temperature control now before you an L&N engineer would be glad to send such additional data as you require.



t of ago.

lett.

ent

orth

cers

ton.

cia-

an

ing



LEEDS & NORTHRUP COMPANY, 4966 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS . TELEMETERS . AUTOMATIC CONTROLS . HEAT-TREATING FURNACES

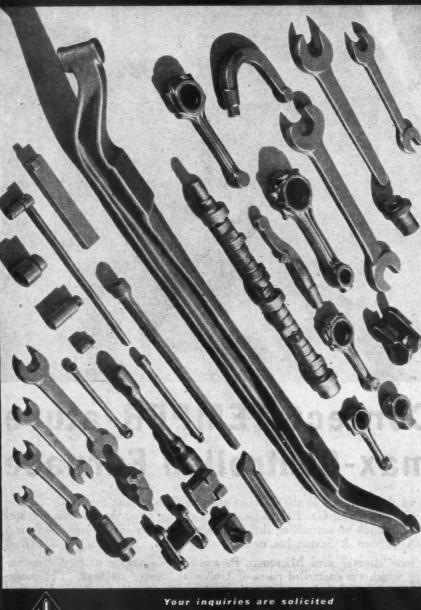
rl Ad N-33(50)

ES

July 15, 1945

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

HERBRAND DROP FORGINGS -- any size or shape to 200 pounds



HERBRAND CORPORATION FREMONT, OHIO

German Radiators

(Continued from page 34)

the method of construction applied this radiator would appear to be cost; in machine and man hours; but further study indicates that, with the appropriate tooling equipment, it would offer no serious difficulties in mass produc tion. As an assembly it leaves the in pression that it would be very mud more resistant to the type of me chanical damage expected from service conditions than in the case of radiators, made from thin gage copper tube and strip.

The assembly of tubes and tanks was encased in a covering strip of alumi num alloy 6 in. wide and 0.160 in. thick A view of the assembly with the cor ering removed is shown in Fig. 5. The covering strip consisted of two portions, one of which was bent over a right angles at the ends, and the two sections were joined at these points by zinc-coated countersunk screws. The outer portion of the covering had, inserted centrally at each end and projecting outwards, a small cylindrical zinc-coated sheet steel pressing, probably a locating device.

Co

STA

The outer and inner surfaces of the sheet metal casing were prevented from distorting by six radially located steel spokes on each side, fitted into countersunk holes at the inner surface of the assembly and tightened by screwed nipples on the outer surface Dimensions, weight, etc., of this radia tor were as follows:

Dimensions-Overall length 23 in: overall width 6 in.; depth 9 in.

Weight-As received 26 lb 8 oz with casing removed 20 lb 4 oz.

Operating Temperature - 240 I maximum.

Operating Pressure-10 psi.

Test Pressure-28 psi.

The chemical compositions of the light alloy parts of this radiator were shown in Table I, which follows.

(Turn to page 112, please)

Only first rate FELTS, meeting required specifications and tests, will function properly. Substitutes will not do. Check this with your engineers . . . then buy FELT with confidence.

American Felt

General Offices: New York

Chicago

GLENVILLE, CONN. Detroit Philadelphia

San Fran

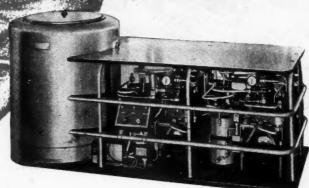
... for over 40 years THE PIONEER MANUFACTURER OF

POTTER & JOHNSTON MAC

PAWTUCKET, RHODE ISLAND

that you need

Records Submitted by Deepfreeze Users Establis Cold Treating as a Timesaving to Low Cost, Quality Production



OPERATION	PART	PERFORMANCE PRIOR TO COLD TREATMENT PERFORMANCE PERFORMANCE PERFORMANCE TREATMENT		
HARDENING	High Speed Drill Tap Milling Cutter	48 holes per grind 40 pieces per grind T hours per grind	956 holes per grind 500 pieces per grind 94 hours per grind	
STABILIZATION	Pump Plunger Gauge Blocks Lapping Flats	Operation unsatisfactory due to metal growth. Blocks expanded and warped. Resurfacing required every 2 to 3 hours.	Perfect operation indefinitely, due to complete stabilization. Blocks held original size and shape Resurfacing required every 2 to 3 days.	
SHRINK-FIT	Airplane Land- ing Struts Tapered Roller Bearing Race	20 minutes re- guired for assem- bly: hour to insert in casting	10 minutes required for assembly. minute to inself in casting	

These performance records are typical of economies obtained in many of the nation's leading industrial plants by the use of

Cold Treating in various production processes—economies which can be duplicated under similar conditions in your plant.

Cold Treating is used to accomplish a variety of purposes—all with equal efficiency and economy. Foremost among these are hardening metals and metal parts; stabilizing precision parts, gauge blocks, lapping flats, etc.; shrinking metal parts for rapid assembly; and testing of instruments and equipment for high altitude, low temperature operation. In addition, Cold Treating is performing a multitude of specialized operations too numerous to mention.

You, Too, Can Profit by Using Cold Treating

Whatever your production, a survey of the outstanding results obtained by applying sub-zero temperatures to industrial operations—a few of which are shown in the panel at left—is convincing proof of the economical value and utility of this newest "tool" for industry. Think what such results can mean to your operations in terms of production economies and improved quality of your product.

Let Deepfreeze Engineering Service Assist in Adapting Cold Treating to Your Production

If you are unfamiliar with industrial Cold Treating or are using it on a limited scale and are interested in increasing its range of utility, contact Deepfreeze Engineering Service. Our experienced refrigerating engineers will make a complete study of your product and production setup and enumerate the possibilities and advantages of applying it on the broadest possible scale. This service will not obligate you in any way.



)rs 1)

plied t e costin furthe propri

ld offer produc the im y mud of me service

radia r tube

iks was alumi. . thick

he cor 5. The

o porover E he two ints by Th ad, in nd pro

ndrie , prob

of the ventel

locate d into surfac

ed by urface

radia

23 in.

8 oz.;

40 F

of the

r

) F

TRIES

FREE ... Complete Cold Treating Information

This new 40-page booklet contains all of the facts necessary for a complete understanding of industrial Cold Treating. It explains in detail what occurs within a metal structure when cold treated; illustrates its many uses and resultant savings in time and money; lists up-to-date Cold Treating procedures, gives the names of manufacturers using Deepfreeze equipment; and numerous additional data which you need in applying it to your production. Write today for your copy of Bulletin No. I-4.

2314-7 DAVIS STREET,



SERVES OVER 100 DIFFERENT HOSE SIZSE

The Central ALL-SIZE Hose Clamp, like the Water Buffalo, is not concerned about size... for it serves over a hundred different hose sizes. The standard length, for example, serves any hose from 1" to 3" O.D.

SEND FOR



No. 45-7A

Thus the ALL-SIZE eliminates the need for different size hose clamps. And . . . it is powerful enough for all production and service requirements; is easiest to use in hard-to-get-at-places; has fastest clamping action; goes on or off in a jiffy, without disconnecting the hose line; has plenty of take-up, even on synthetic hose; is rustproof, leakproof, self-locking; can't strip or loosen . . . ALL-SIZE Clamps are standard for U. S. combat vehicles.

CENTRAL EQUIPMENT CO. CHICAGO S, ILLINOIS

(Continued from page 110)

Table I

CHEMICAL COMPOSITIONS OF LIGHT ALLOY PARTS OF JU 88 RADIATOR TYPE B

Composition, %

Component	Cu	Mn	Mg	Si	Fe	1
Sheet covering	4.16	0.46	0.93	0.48	0.38	BRRR
Tubes	<0.01	Trace	Trace	0.245	0.18	
Header tanks.	0.02	1.23	Trace	0.26	0.37	
Baffle sheets	<0.01	0.31	0.96	0.98	0.37	

The mechanical properties of the sheet metal cover were: 0.1 per ear proof stress—38,100 psi; Maximus stress—60,500 psi; Elongation 253 per cent.

From the metallurgical viewpointhere was nothing unusual in the van ous aluminum alloys used. The tube were of pure aluminum of high quality their iron content being only 0.18 pe The header tanks were mai from typical DTD 213 type of material the baffle sheets between the tubes we of an alloy containing 1 per cent may nesium and 1 per cent silicon, while the sheet metal covering was a dun lumin type alloy. Micro examination of this latter material showed it to of good ordinary quality. The cover ing had been anodized, and wherever there was contact between steel as light alloy the steel had been coate with zinc, probably electrolytically. The rubber hose connections gave the in pression that the fabric content was a high and the rubber content as low a possible.

This radiator was examined by the Rolls Royce research laboratory on the half of the Ministry of Aircraft Production. The examination is said thave shown nothing particularly note in either construction or materials, the latter being essentially brass, coppel low carbon steel and lead-base solder. The brass used for the tubes appeared to be very soft, presumably for many

(Turn to page 114, please)

WANTED

Aircraft Engine Man

Layout draftsman designer wanted to work on high output aircraft engine. A long-range project of a rapidly expanding department of an old established company. Excellent post war future. Only men with aircraft engine drafting experience can be considered. Statement of availability required.

Box 42, CHILTON COMPANY Chestnut & 56th Sts., Philadelphia 39, Pa.

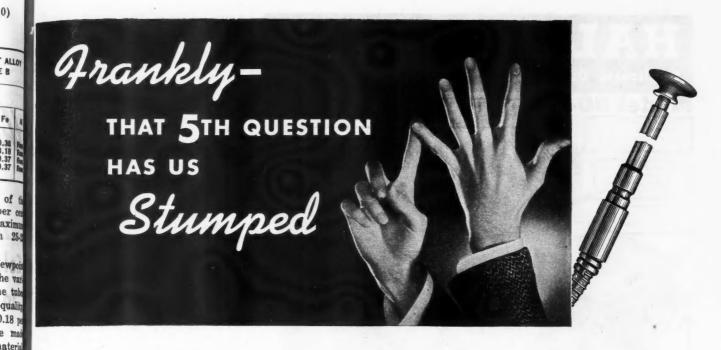
MILLHOLLAND

Automatic MILLING - BORING Units

1/2 to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W.K. MILLHOLLAND MACHINERY Co.
Indianapolis, Ind.



WHAT IS A TRU-LAY PUSH-PULL?

A means of transmitting back-and-forth action through a flexible, non-compressible conduit.

IN HOW MANY SIZES ARE TRU-LAY **PUSH-PULL CONTROLS MADE?**

There are three sizes of operating member: 1/8", 3/16" and 1/4". Standard movement of 1, 2, 3 or 4 inches. Others available on special order.

CAN TRU-LAY PUSH-PULL BE USED FOR CLOSE ADJUSTMENT?

Yes. Micro-Push-Pull permits screw adjustment backward or forward from any point in the range of the control.

4 WHY IS TRU-LAY PUSH-PULL ACTION POSITIVE?

Because the operating member is a strand of preformed cable on which armoring is processed. It can neither stretch nor compress.

HOW MANY USES ARE THERE FOR TRU-LAY PUSH-PULL?

We don't know. New uses are constantly being found. If you have in mind any possible application, we will be glad to give you detailed information. Just write our Detroit office.



PUSH-PULL AUTOMOTIVE CONTROLS

Also manufacturers of TRU-STOP Emergency BRAKES—with ventilat-ed discs that dissipate the heat of braking.

ACCO

0)

.30 1.18 1.37

es we

nt ma , whil

a dun

inatio t to h

COVE

hereve

el an

coate

y. Th he in

was a

low a

by the on be

t Pro-

nove

ls, th

solder

max

rits

IC

CO.

TRIES

6-235 General Motors Building, Detroit 2 · 695 Bryant Street, San Francisco 7 · Bridgeport, Conn.

AUTOMOTIVE AND AIRCRAFT DIVISION AMERICAN CHAIN & CABLE

In Business for Your Safety

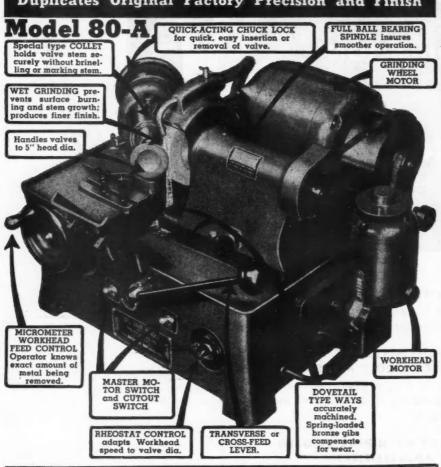
July 15, 1945

When writing to advertisers please mention Automotive and Aviation Industries

113



Duplicates Original Factory Precision and Finish



F Precision and Finish are important in production, they're equally important in service. This HALL Wet Type Aero Valve Refacer insures the restoration of original factory precision and finish wherever aero valves are serviced.

THE HALL MANUFACTURING COMPANY . TOLEDO 7, OHIO

mum ductility. There was no sign of corrosion.

The radiator as received for examination was very badly damaged, a shown in Fig. 6. The center was squashed to less than half the original height and both headers were burst open by distortion at the joint to the end plates. One of the coolant pipe connections was missing.

The top cover plate was bolted to the underside of the upper wing surface by two bolts at the center, where rubber washers between the two surfaces had acquired a permanent set. A strip of rubber ¾ in. thick, running the length of the radiator, had been fitted between the two surfaces. The ends of the radiator were suspended by means of a steel-faced rubber block and were attached to the wing bracing by two bolts at either end. The overall length was 43 in., cooling length 40 in, original height 12 in., depth 7 in. and weight empty 135 lb.

The radiator in general consisted of brass tubes running from one header to the other, with copper fins and brass headers. The tubes were 34 in. wide by 3/32 in. deep, made from 0.008 in. thick brass strip, bent on a former to shape and the ends joined, as shown in Fig. 7, the joint being nipped together whilst on the former. The copper fins, 0.0035 in. thick, were at right angles to the tubes from top to bottom cover plate. They were alternately straight and U-shaped between the tubes as shown in Fig. 8. The upper two-thirds of the brass headers was double sheet. The steel suspension brackets were copper-riveted to the headers and the cover plates were connected by four spoke ties at each side and four brass strengthening ribs were located at these points of the radiator. The tubes, fins and end plates were solder dipped The interior surface of the tube was coated with solder. Headers and end plates were soldered together and the cover plates soldered to the headers.

Write cheerful letters to the boys at the front.

LITTELL AUTOMATIC REELS

LOAD coil stock faster. Improve quality. Reel holds and centers coil stock. Supplied in plain or motor-driven types for handling coils 200 lbs and up. Also Coll Cradles, Roll Feeds, etc. Request bulletins.

F. J. LITTELL MACHINE CO. 4155 Ravenswood Ave., CHICAGO 13, III.





PAPER
BOXES
PRODUCTS

ENVELOPES
PRODUCTS

AND CANS

PIERCE PAPER PRODUCTS CO.
2720 AUSURN STREET, ROCKFORD, ILLINOIS

For Ignition Switch Service; Directional Switches; Dove Tails
MITCHELL DIVISION

NITCHELL DIVISION
Philadelphia, Pa.

Air Cleaners—Oil Bath and Pre-Cleaners for Engine Protection UNITED AIR CLEANER DIV. Chicago, III.

Divisions of

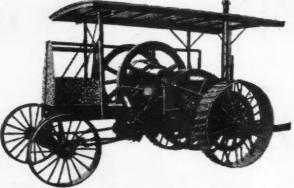
UNITED SPECIALTIES COMPANY

9705 Cottage Grove Ave.

Chicago, III.



Are the Joints in Your Tractor's Steering Column Out-of-Date



Way back when the tractor's top speed was three or four miles an hour, chains could handle the steering. But since rubber tires and anti-friction bearings have made higher speeds possible, steering column

> designs require joints having roller bearings and lifetime lubrication. MECHANICS 1 RA Roller Bearing Steering Joints, using heat-treated alloy steels, hardened and ground to precision and factory packed with lubricatant for life, provide easy, accurate and long lifed steering . . . without further lubrication. Modern design, utiliz-ing stampings and brazing, results in a price you can offord.

MECHANICS Roller Bearing UNIVERSAL JOINTS



Mechanics Universal Joint Division

BORG-WARNER CORPORATION 2026 Harrison Avenue Rockford, Illinois











Design of Coronado PB2Y-3

(Continued from page 22)

itself is on the port side of this compartment. A ladder and a telephone booth-type door connect the main entrance compartment with the flight

The area aft of the galley, between bulkheads four and five, is divided into upper and lower sections. The upper level contains a platform and ladden for access to the astrodome. The lower level is a heated and ventilated compartment with four bunks, two lockers. and a folding table for the crew.

The top waist machine gun turret is situated between bulkheads five and six Below, and on each side of this, are the side waist gun stations.

In the tail compartment, aft of bulk head six, is an enclosed and soundproof auxiliary power unit, located forward and starboard, and two bunks, located forward and port. Behind these is the tail machine gun turret.

Tail Group

The Coronado tail group comprises a stabilizer, two elevators with controllable tabs, two fins, and two rudders with controllable tabs. All of these surfaces are removable for disassembly and stowage. The stabilizer and fins are aluminum alloy frames, covered with smooth sheet metal. The elevators and rudders are aluminum alloy frames, covered with fabric.

All of the movable tail surfaces are balanced both dynamically and statically The rudders only are provided with a standard locking system. Each fin is firmly attached to one end of the stabilizer, and the stabilizer is a one piece structure bolted to the huli.

Service and Repair Features

Particular attention was given to service and repair problems in the design of the Coronado. Accordingly, (Turn to page 118, please)

COLD FINISHED BARS . AIRCRAFT STRIP STEEL . COLD ROLLED STRIP STEEL COLD ROLLED SHIM STEEL . SHEET STEEL . ROUND EDGE FLAT WIRE

GENERAL STEEL WAREHOUSE CO.,



JOHN CRANE Bellows

Designed for AIRCRAFT, MARINE, JEEP. TRUCK, TRACTOR AND AUTOMOBILE PUMPS

CRANE PACKING COMPANY, 1818 CUYLER AVE.

THE FRANCIS COMPANY

Engineers

Designers

Design and Development of Products Production Machinery Automotive and Allied Equipment

343 S. Dearborn Street, Chicago 4 Telephone - Har. 7747 -

Complete Arc Welding and Materials Handling Service

AC and DC Electric Arc Welders and Electrodes, Welding Positioners, Electris Hoists and Cranes. 559 W. National Ave., Milwaukee 14, Wi

HEEGEN

ANG WELDERS - EXCAYATORS - ELECTRIC CRAMES PHI MOTORS - HOISTS - WELDING ELECTRODES



We Will Manufacture Your Product on a Contract Basis

You may need parts, or complete products to market under your own brand, and not have enough capacity for their production.



The same equipment that set war production records can supply your peacetime products on a profitable basis. We have skilled, experienced men who specialize in many different types of work.

Our company has expanded 4 times, delivered over 6 million

screw machine parts monthly to the prewar aviation industry. More than 75% of all military aircraft are equipped with our fittings. Four Army-Navy "E" Awards testify to the production ability of Poulsen & Nardon men and machines.



Why not put this skill and experience to work on your production problems? Write our Product Research Department for prompt, accurate estimates on parts or products engineered to your specifications. Poulsen & Nardon, Inc. Main Plant: 2665 Leonis Blvd., Los Angeles 11, Calif., LAfayette 0961. Eastern Office: 345 Madison Ave., New York 17, N.Y., LExington 2-1170.



Now manufacturing for all industry:

CABLE TERMINALS . JUNCTION BOXES . ROD ENDS . CONDUIT FITTINGS.

i en-

into pper dder

kers

et is

oulkproof

ward cated s the

rises conrudl of

dislizer

mes

The m al-

aticvided Each f the

e de-

ngly,

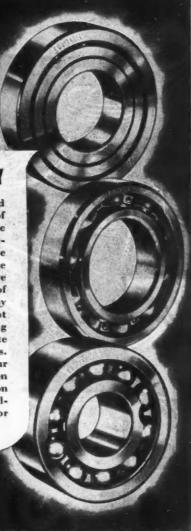
RIES



the EQUITABLE POLICY

Since the war began we have devoted ourselves largely to the production of bearings to special dimensions and we expect that because of our wide experience in their construction, these bearings will continue to be a large part of our output. However, we are now devoting an increasing amount of our facilities to the production of many standard bearings and we have just published our new 28 page bearing catalog showing in detail the complete line of Equitable Standard bearings. We continue to offer to work with your engineers in the design, application and service of any type of anti-friction bearing on which you may ask specialized advice. Look to Equitable for bearing information for any type

application, standard or special.



Write for our new catalog

vitable CO. Inc.

. WALDEN, NEW YORK

most parts of the airplane can be removed and replaced in a minimum amount of time. Examples:

Item	No. of Men	Hours
Engine assembly unit (includ-		· · · · · · · · ·
ing mount, propeller, etc.)	4	1.5
Propeller alternator	1	1.0
Magneto (right or left)	2	1.0
Starter	2	3.0
Generator	2	2.0
Carburetor	2	3.0
Aileron	2	2.0
Outer wing panel	4 .	4.0
Fin	2	4.0
Stabilizer	2	3.0
Rudder	2	2.0
Elevator	2	2.0
Oil Cooler	2	2.0
Ofl tank (unless integral)		
(after engine assembly is re-		
moved)	2	2.0
Any instrument	1	0.5
Fuel strainer	1	1.0
Vacuum pump	1	1.0
Hydraulic pump	1	1.0
Oil pressure relief valve		0,5
Propeller and accessories		2.0
Fuel pump, engine		1.0
Booster fuel pump		1.0
Anti-corrosion capsule	1	0.5
Cables for main control sur-		
faces	4	3.0
Radio receiver	1	0.2
Radio transmitter		0.3
Flexible gun (except turrets).		0.5
Bomb rack	1	0.1
Battery	1	0.3
Auxiliary power unit	-	4.0

Beaching Gear

The Coronado beaching gear consists of two main forward units and a tail unit. Provisions are made for stowing the two main units in the wing bomb bays, while the complete tail unit may be stowed in the hull.

Each of the main beaching gear wheels is provided with a pneumatic tire and a self-draining hand brake, which can be operated from the ground or from a hull beaching gear hatch. The tail wheel unit is equipped with two small pneumatic tires (26 in. diam), either of which can be quickly replaced.

The main gear wheels are attached directly underneath the wing, one on each side of the hull, while the tail wheel attachment socket is aft of the second step.



OIL SEALS **GREASE RETAINERS**



Heavy, medium and light stampings in any quantity. A steady flow production - when you want it. WORCESTER STAMPED METAL CO. 9 Hunt Street, Worcester, Mass.



Even

grap

plete

value

may

VOU

in th

which

Jul

AUTOMOTIVE and **AVIATION INDUSTRIES**

Penetrates into Leading Plants in the **Automotive and Aircraft Industries**

COMPLETE LIST OF ALL dag DISPERSIONS NOW AVAILABLE! New Products Listed

A number of new dispersions, developed for war uses by Acheson Colloids Corporation, are presented for the first time in a new bulletin (440). Other members of the versatile dag family of colloidal and semi-colloidal graphite products are also described.



Even though you now use dag colloidal graphite, it will pay you to get this complete list. New applications, even more valuable than those you now employ, may suggest themselves to you when you review the wide range of products in the dag line. If you have problems which dag colloidal graphite may be

lum

1.5

3.0

3.0

1.0 3.0 2.0 2.0

2.0

.0

.0

.0

.3

.5

ists

tail

ing

mb

nay

ear

atic

and

ith in. kly

hed on tail

the

able to solve, the Acheson Colloids' experienced technical staff is ready to help you without obligation. Send complete data, samples, blue prints, charts etc., or ask to have a Service Engineer visit your plant. Other free literature on specific applications for dag colloidal graphite is ready. See below.

Presenting
A COMPLETE CATALOG
OF dag
COLLOIDAL GRAPHITE
DISPERSIONS



trisditional. This bulletic suggests runique voluntie, best; industriables and expirative software on discount for "day" collected gauge-five discount for this case, quay from agen flame in well conficient sweets to case of the case of this pour name.

dag colloidal graphite

ACHESON COLLOIDS CORPORATION, Port Huron, Michigan

TO GET THESE:

This new literature on "dag" colloidal graphite is yours for the asking:

- 430 A general booklet on the story of "dag" colloidal graphite. 12 pages profusely illustrated.
- 440 A complete list of "dag" colloidal graphite dispersions with applications.
- 421 "dag" colloidel graphite for ASSEMBLING AND RUNNING-IN ENGINES AND MACHINERY.
- 422 "dag" colloidal graphite as a PARTING COM-
- 423 "dag" colloidal graphite as a HIGH TEMPERA-
- 431 "dag" colloidal graphite for IMPREGNATION AND SURFACE COATINGS.
- 432 "dag" colloidal graphite in the FIELD OF ELECTRONICS.

- MAIL THIS: _____

JML Co. A-I

ACHESON COLLOIDS CORPORATION, PORT HURON, MICHIGAN Dept. G-1
Please send me, without obligation, your new bulletin No. 440 on dag colloidal graphite, and also free copies of the specific bulletins checked below.

No. 430 NAME

No. 422 ADDRESS

No. 432 (Lubricants containing dag colloidal graphite are available from major oil companies.)



NOZZLE TESTER Keeps Diesel Engines Running Efficiently

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p. s. i. Prevents costly delays and possible damage to engine.

'Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.



TESTS FUEL INJECTORS
AND HYDRAULIC DEVICES at Pressures up
to 10,000 p.s.i.



AIRCRAFT & DIESEL EQUIPMENT CORP.

DEPT. 21: 4411 N. RAVENSWOOD AVE. CHICAGO 40, ILLINOIS

Classified Advertisements

YOUNG MAN with capital and business experience seeks manufacturing or selling business for Detroit operation. Product must be good with future possibilities. Address Box 41, Chilton Company, 56th and Chestnut Streets, Philadelphia 39, Pa.

Positions Available — Design, Development and Research Engineers. Mechanical or electrical for work in one of the largest Resistance Welder Manufacturers. Salary open. Located, eastern Ohio. Our employees notified of this ad. Statement of availability required. Reply giving qualifications, Box 44, Chilton Company, Chestnut & 56th Sts., Philadelphia 39, Pa.

MECHANICAL and ELECTRICAL ENGINEER: With at least some practical experience to assist with the research and development of new products for automotive industry. Compensation commensurate with ability. State age, salary desired, past experience, qualifications, education and three references. Statement of availability required. Address Box 45, care Automotive and Aviation Industries, Philadelphia 39, Pa.

Keep Buying War Bonds

0

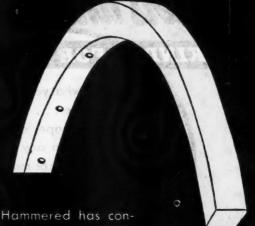
Factories Tuning Up

(Continued from page 44)

The machine tools situation, long a source of worry to the automotive industry, appears to be easing off somewhat. The recent action by the Treasury Department in stopping delivery of Lend Lease orders to Russia has resulted in diverting a few machines orginally scheduled for the Soviet into domestic industry and in freeing up some capacity for home orders. However, the total is not large, and some companies report that they still will have to wait until the fall and winter months before they can get delivery on some items.

Steel, which was the determining factor on which automotive quotas were set by WPB, apparently is not going to be as much of a problem as some other materials, principally textiles, decorative bright metal, and alkyd resins used in paint. WPB now has stepped up its original estimate of steel available in the third quarter to 1 million tons, which is conceded to be a conservative guess, and it is thought likely that the total will be nearer 1.5 million after the reports are all in. The textiles situation remains tight, with manpower for southern looms still the limiting factor. Although the nickel supply is better than formerly, WPB reports that present stocks are not fully adequate for military require-





Ring Leaders

g a inomesury
of reines into up
lowome

will nter y on

fac-

were

ome iles,

lkyd has

miloe a

1.5 The

with the ickel VPB

not

nire-

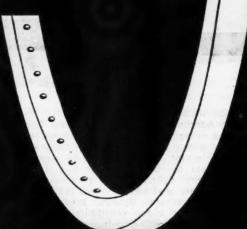
RIES

Since the earliest days of the automobile, American Hammered has consistently supplied piston rings that are a year or more ahead of the field. Those to whom efficient, economical engine performance is the only standard of piston ring value demand American Hammered! Koppers Company, Inc., American Hammered Piston Ring Division, Baltimore, Maryland.

AMERICAN HAMMERED

Compression Rings

The tension is hammered into American Hammered Compression Rings! That's why their tension is not affected by heat or by wear. That's why these rings keep their tension, assure dependable performance throughout their life! The tension hammered into the inside face of American Hammered Compression Rings results in equal outward pressure against the cylinder wall, compensating for wear and maintaining maximum compression. There is an American Hammered Piston Ring Set especially engineered for each and every engine.



American Hammered Piston Rings

A KOPPERS PRODUCT

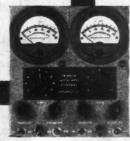


ments, and the outlook is for enough to plate operating parts of civilian items, but not for decorative purposes. At any rate, the Automotive Div. of WPB is expected soon to inform automobile makers about the nickel and chrome available for decorative purposes, and at the same time to give a complete report on all aspects of the materials situation.

Detroit has had a taste of what lies ahead with labor in the recent wave of jurisdictional strikes which for time threatened to tie up reconversion activities of several automotive companies. Bone of contention is the matter of which major union-AFL or UAW-CIO-is to handle the moving and installation of machinery in plants The dispute flared at the Chrysler Corp. where the AFL construction men walked off the job when the company refused to abide by a union dictum that its men must do all the installation and other work on any plant construction job. On the other hand, UAW-CIO maintenance men believe that installation of machinery is their proper function and have demanded that no AFL workers be hired until all CIO maintenance men have been employed. The result was a city-wide tie-up, which finally was settled by negotiation at the top level. Under the truce, members of both groups were ordered back to work with the understanding that all future jurisdictional disputes are to be settled by mediation and arbitration, rather than by strikes.

Here's a New Carrier System

You'll Want to Know More About!



ASIDE from measuring static and dynamic pressures, there are literally hundreds of uses for the new Trimount Carrier System in the aircraft, automotive and general industrial fields. This carrier system, when used with primary elements manufactured by Trimount, and with an oscillograph or other indicating equipment, can be used for studies of: steam, gasoline and Diesel engine cylinder head pressures, manifold pressures, supercharger and blower pressures, fuel system pressures, air scoop pressures, dynamic pressures in pumps and compressors, turbine blade elongations, strain, etc. When used with suitable recording instrument, such as a recording oscillograph, indicator cards on internal combustion engines, compressors, pumps, etc., can be made and many other similar applications are possible.

Write for complete information.

TRIMOUNT INSTRUMENT

37 W. VAN BUREN STREET, CHICAGO 5, ILLINOIS

WHITNEY- JENSEN PRODUCTS

TOGGLE-ACTION

FOOT PRESSES

7" 10" 18" 24" THROAT DEPTHS

A powerful linkage MULTIPLIES foot pressure for fast, easy punching and forming work. No kick or violent force is required, steady pressure produces a force of up to 3½ tons per square inch at the point of punching. Capacity 2" hole in 16 ga. iron, 100 holes per minute or better. A light, sturdy machine for short or long-run jobs.



A wi ac tra

NO. 38 BENCH PUNCH

A small, powerful, throatless-type sheat with capacity up to 3/16" mild steel. Can action provides straight up-and-down bladt travel. Length of blade 5". Size, overall 11" x₁834" x 7½". Weight 45 lbs. All parts interchangeable for easy replacement.

Write for new
PUNCH and DIE CATALOG

WHITNEY METAL TOOL COMPANY
190 FORBES ST. ROCKFORD. ILL.